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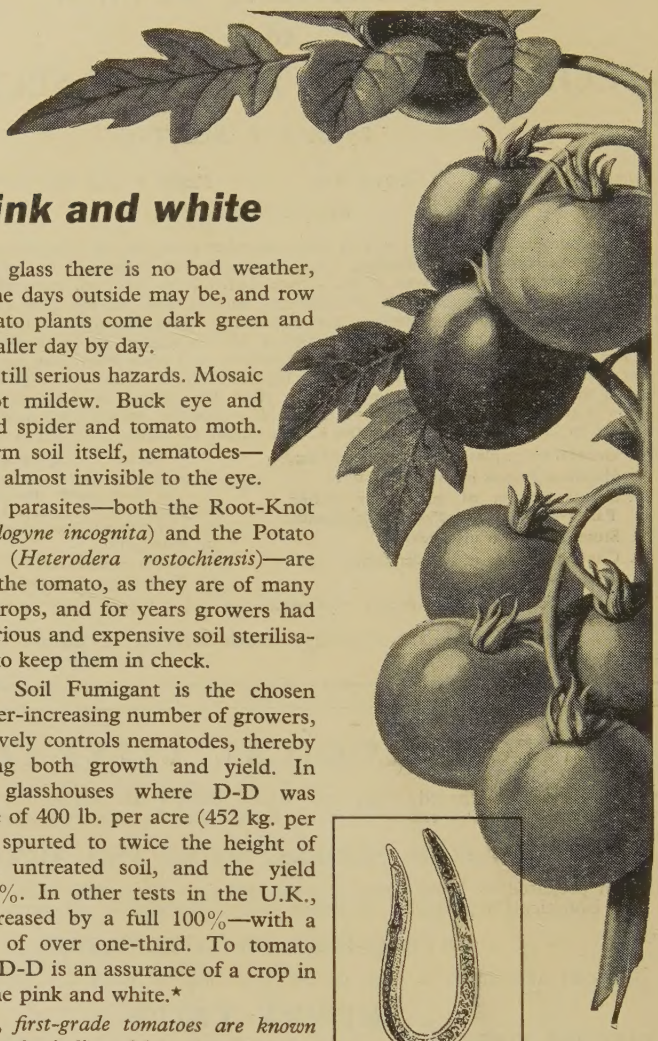

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REVIEW

OF

APPLIED ENTOMOLOGY.

SERIES A.

Vol. 47. 1959.

UBRIZSY (G.) & REICHART (G.). **Termesztett növényeink védelme.** [Protection of our cultivated Plants.]—9½ × 6½ ins., 447 pp., 452 figs., 1 fldg. table, 5½ pp. refs. Budapest, Mezőgazdasági Kiadó, 1958. Price 60 *Ft.*

The main part of this book comprises sections on the diseases of cultivated plants in Hungary, by Ubrizsy, and on the insects that attack the plants, by Reichart. The plants concerned comprise field crops, vegetables, grazing and fodder plants, fruit trees and bushes, and vines. There is also a section on stored-product pests, by Reichart, three, on the chemical control of insects and diseases, on biological control and on the forecasting of outbreaks, by Ubrizsy, and one on the mechanisation of plant protection, by L. Molnár.

KADOCSA (G.). **Új és újabban tömegesen jelentkezett ritkább kártevők.** [New and recently numerous Minor Pests.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 53–75, 41 refs. Budapest, 1957. (With Summaries in Russian & German.)

The species recorded as injurious in Hungary for the first time include *Hylemyia* (*Phorbia*) *penicillifera* (Jermy) and *H.* (*P.*) *securis* (Tiensuu), which both attack wheat and rye, overwinter in the pupal stage, have one and two generations a year, respectively, and were previously misidentified as *H.* (*P.*) *genitalis* Schnabl & Dziedzicki; *Tanymecus dilaticollis* Gylh., which has recently damaged maize and beet; and *Thrips lini* Lad. (*linarius* Uzel), which destroys the buds of flax.

SZALAY-MARZSÓ (L.). **Populációsdinamikai vizsgálatok egy répaföld répalevéltetu** (*Doralis fabae* **Scop.**) **állományán.** [Investigations on the Population Dynamics of *Aphis fabae* in a Beet Field.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 91–101, 4 figs., 16 refs. Budapest, 1957. (With Summaries in Russian & English.)

Observations in a field of beet in the district of Szabolcs in 1955 showed that the population of *Aphis* (*Doralis*) *fabae* Scop. increased sharply in early June, reached a peak on 10th July, and then decreased very rapidly to zero. The sudden decline is attributed to the weather rather than to natural enemies, which were scarce. Immature alates appeared on 17th June, and insecticides would be best applied at this time, since most of the aphid

spread has already occurred, the leaves are small and have not yet curled. and natural enemies are still not numerous.

Szalay-Marzsó (L.). **Erdei gyapjaspille** (*Lymantria dispar* **L.) tömegszaporodásával kapcsolatos megfigyelések 1954 és 1955 nyarán a Nyíregyházi erdőben.** [Observations during the Summers of 1954 and 1955 in the Nyíregyháza Forest in Connection with the Outbreak of *L. dispar.*]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 113–123, 9 figs., 21 refs. Budapest, 1957. (With Summaries in Russian & English.)

The outbreak of *Lymantria dispar* (L.) referred to, which occurred on oak in north-eastern Hungary, began in 1954 and increased in severity in 1955. Defoliation in that year was severe over a considerable area, and the larvae in this, deprived of sufficient food, were so heavily attacked by a virus disease that only 10 per cent. of them pupated. The adults that emerged were small, and the females laid an average of only 140 eggs each, as compared with 325 in less heavily infested parts of the forest. The average reached 747 in areas not previously infested, and large masses of eggs were present on the trunks, so that the outbreak was thought likely to continue. Parasite activity was low.

Sáringer (G.). **A repcedarázs** (*Athalia rosae* **L.** (*colibri* **Christ.) Tenthredinidae, Hym.).** [The Rape Sawfly, *A. rosae.*]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 125–183, 25 figs., 117 refs. Budapest, 1957. (With Summaries in Russian & German.)

The author reviews the nomenclature of *Athalia rosae* (L.), describes all stages of this sawfly, and records field and greenhouse observations in Hungary on its bionomics on rape and white mustard (*Sinapis alba*). In that country, it has two or sometimes three generations a year. Adults of the overwintering generation emerged between 2nd and 9th May in the greenhouse, where the temperature at a depth of 2 in. in the soil was over 20°C. [68°F.], and between 6th and 19th May in the field, where it was under 20°. The adults that emerged in the greenhouse comprised 79 females and 8 males. They paired on the day of emergence, one male being observed to do so with three females in 45 minutes, and oviposition began three days later. The eggs were laid singly close to the edges of the leaves, at the rate of 15–87 per female, and the oviposition period lasted 9–17 days. The larvae hatched in 6–8 days at an average temperature of 20°C., began feeding on the leaves after crawling about for a few days, and passed through five instars if they were males and six if they were females in about a fortnight. Investigations on the amount of food consumed are described. The pupal stage was passed in the soil and also lasted about a fortnight. Winter was passed in the eonymphal stage in the cocoon. Infestation is shown from a review of the literature to be severe every 5–8 years. The larvae were parasitised by *Tachina nigricans* Egger and *Perilampus aeneus* (Rossi). In tests with insecticides, the best results were given by an emulsion spray containing 1 per cent. of a mixture of DDT and BHC.

Szalay-Marzsó (L.). **Az amerikai fehér szövőlepke** (*Hyphantria cunea* **Drury) élősködői a Nyírségben 1954 nyarán.** [Parasites of *H. cunea* found in the Nyírség Region in the Summer of 1954.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 185–189, 7 refs. Budapest, 1957. (With Summaries in Russian & English.)

Larvae of *Hyphantria cunea* (Dru.) were collected in two districts in north-eastern Hungary in the summer of 1954 and reared for observations

on the frequency of parasitism. At one of them, 34 per cent. of the larvae gave rise to adults of *H. cunea*, 51·4 per cent. to those of *Compsilura concinnata* (Mg.) and less than 5 per cent. to Hymenopterous parasites. At the other, 25·5 per cent. gave rise to *H. cunea*, 20·1 per cent. to *C. concinnata*, 16·5 per cent. to *Theronia atalantae* (Poda), 8·4 per cent. to *Psychophagus omnivorus* (Wlk.), 6·9 per cent. to *Pimpla instigator* (F.), 1·6 per cent. to *Monodontomerus aereus* Wlk., 0·9 per cent. to *M. dentipes* (Boh.) and 0·6 per cent. to *P. turionellae* (L.). The abundance of *T. atalantae* was favoured by an outbreak of *Aporia crataegi* (L.), which is also parasitised by it.

Nagy (B.). **Vizsgálatok** *Hyphantria*-**ragadozó** *Arma custos* **F. (Heteropt. Pentatomidae) poloskákon.** [Investigations on *A. custos*, a Predator of the Larvae of *H. cunea*.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 191–226, 24 figs., 16 refs. Budapest, 1957. (With Summaries in Russian & German.)

As *Arma custos* (F.) has been increasingly observed since 1952 preying on the larvae of *Hyphantria cunea* (Dru.) in Hungary, investigations on its bionomics were made. The Pentatomid was easily reared on plant and insect food in the laboratory. The egg and nymphal stages lasted 10–12 and about 41 days, respectively, at 22–26°C. [71·6–78·8°F.], and there was one complete and a partial second generation in the year, adults of both sexes overwintering. The females laid up to 161 eggs each. In the field, the nymphal stage lasted 43–48 days, and up to nine nymphs were found in individual nests of *H. cunea*. Both nymphs and adults fed on the larvae, and observations on the amount of food consumed, which was considerable, are recorded.

Reichart (G.). **Újabb adatok a barnásfekete borsómoly** (*Laspeyresia nigricana* **Steph.) magyarországi elterjedéséhez és biológiájához.** [Recent Data on the Distribution and Bionomics of *Cydia nigricana* in Hungary.] —*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 227–231, 2 figs., 9 refs. Budapest, 1957. (With Summaries in Russian & German.)

Although *Cydia* (*Laspeyresia*) *nigricana* (F.) has long been known to infest peas in the Carpathian Basin, it was not observed in Hungary until 1951, when it occurred near Budapest. It was observed again in 1955, when 1·3–19·4 per cent. of the pods and 0·5–9·4 per cent. of the peas were damaged. The bionomics of the moth in this area have not been studied, but it apparently has one and a partial second generation in the year.

Nagy (B.). **Gradobiológiai megfigyelések a** *Chloridea maritima* **Grasl. (Lepid. Noctuidae) magyarországi kártétele alkalmával.** [Observations on the Bionomics and Mass Appearance of *Heliothis maritima* during an Outbreak in Hungary.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 233–252, 14 figs., 22 refs. Budapest, 1957. (With Summaries in Russian & English.)

Serious damage was caused in several regions of Hungary in the summer of 1954 by the larvae of Noctuids. The most unusual of these was *Heliothis* (*Chloridea*) *maritima* subsp. *hungarica* (Kovács), which damaged sweet clover (*Melilotus alba*) and many other wild and cultivated plants. The first half of the summer was cold and wet, but the preceding autumn had been long and warm. A few larvae were still present in July, but the majority had pupated in the soil. Adults were observed in August. Pupae of the second generation entered hibernation.

Jermy (T.). **Adatok a *Hyphantria cunea* Drury hernyóiban élősködő fürkészlegyek (Tachinidae) ismeretéhez.** [Contributions to Knowledge of the Tachinids parasitising the Larvae of *H. cunea*.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 253–262, 23 refs. Budapest, 1957. (With Summaries in Russian & German.)

The indigenous Tachinids found parasitising the larvae or pupae of *Hyphantria cunea* (Dru.) in Hungary in 1948–55, in order of decreasing frequency, comprised *Compsilura concinnata* (Mg.), *Tachina larvarum* (L.), *T. fallax* Mg., *Pales pavida* (Mg.), *Ptychomyia selecta* (Mg.), *Sturmia inconspicua* (Mg.), *Zenillia* (*Exorista*) *libatrix* (Panz.), and *T. fasciata* var. *moreti* R.-D. *T. larvarum* and *T. fallax* were the commonest in 1948–50, but *C. concinnata* displaced them in the later years. All require alternative hosts if they are to be of much value, since their life-cycles are not synchronised with that of *H. cunea*, and they are unlikely to exert decisive control of outbreaks of the latter.

Nagy (B.). **Újabban megfigyelt ragadozópoloskák** (*Pinthaeus*, *Troilus*) ***Hyphantria* hernyófeszkekből.** [Recently observed predacious Bugs (*Pinthaeus* and *Troilus*) living in the larval Nests of *H. cunea*.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 263–267, 2 figs., 3 refs. Budapest, 1957. (With Summaries in Russian & English.)

Adults of *Pinthaeus sanguinipes* (F.) were observed attacking larvae of *Hyphantria cunea* (Dru.) in their nests in some districts in Hungary in 1954. Nymphs of another Pentatomid, *Troilus luridus* (F.), were observed in the nests in 1955, but were not seen to attack the larvae.

Bognár (S.), Fekete (Z.) & Szabó (K.). **Az arzénvegyületek helyettesítése gyümölcsösökben.** [Replacement of Arsenic Compounds in Orchards.] —*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 269–294, 10 figs., 19 refs. Budapest, 1957. (With Summaries in Russian & German.)

Experiments are described on the control of *Cydia pomonella* (L.) and other Lepidopterous pests of apple in Hungary by means of sprays prepared from a DDT paste. The paste contained 25 per cent. technical p,p′DDT formulated with about 20 per cent. soluble, non-mineral ingredients, including an emulsifying agent, and the particle size was only 1–5μ, so that the coating left on the leaves was hardly visible and the foliage retained its green appearance throughout the vegetative period. In tests in 1952–55, sprays prepared from it proved superior to an equal number of those containing calcium arsenate against *C. pomonella*, *Adoxophyes orana* (Fisch. v. Roesl.), *Spilonota ocellana* (Schiff.) and *Recurvaria nanella* (Hb.), 0·12 per cent. p,p′DDT from the paste affording 90 per cent. control, as compared with only about 50 per cent. for 0·5–0·8 per cent. of the arsenical. There was no scorching of the leaves, and the appearance of the fruits was excellent.

Szelényi (G.). **Újabb adatok az amerikai fehér szövőlepke élősködőinek ismeretéhez.** [New Data on the Hymenopterous Parasites of *Hyphantria cunea*.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 295–312, 1 fig., 26 refs. Budapest, 1957. (With Summaries in Russian & English.)

The author discusses the interrelations of the various insect parasites that have become adapted to *Hyphantria cunea* (Dru.) in Hungary, and describes

(in English only) the adults of both sexes of five Hymenopterous hyperparasites reared from the pupae of the Arctiid there. These are *Dibrachys maculipennis*, sp.n., of which the primary host was not known, *Rhopalotus chalcidiphagus*, sp.n., which was reared in one instance from the pupae of *Psychophagus omnivorus* (Wlk.) in the *Hyphantria* pupae, and *Tetramopria aurocincta* Wasm., *T.* (*Ashmeadopria*) *tetratoma* (Kieff.) and *T.* (*A.*) *rotundata* (Kieff.), which emerged from puparia of *Compsilura concinnata* (Mg.). *T. rotundata* was also found parasitising the same primary host in *Athalia rosae* (L.).

Reichart (G.). **Megfigyelések a borsóormányos** (*Aoromius quinquepunctatus* **L.) magyarországi életmódjához.** [Observations on the Life-history of *Tychius quinquepunctatus*.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 313–339, 24 figs., 23 refs. Budapest, 1957. (With Summaries in Russian & English.)

Szelényi (G.). **Description of a new Species of** *Entedon* **(Hym. Chalcidoidea) parasitising the Larvae of** *Aoromius quinquepunctatus* **L.**—*T. c.* pp. 339–340.

Tychius (*Aoromius*) *quinquepunctatus* (L.) is a common pest of peas and other leguminous crops in Hungary. Observations on the bionomics of this weevil showed that the overwintered adults left the soil at the end of April, when the temperature rises above 15°C. [59°F.], were most numerous in late May or June and persisted until the end of September, surviving for 3–3½ months after becoming active. They fed on various plant parts, later including the pods, and paired when the peas were in flower. Eggs were laid through holes gnawed in pods that were half-grown, or older, but still green, at the rate of 3–6 per pod. In the laboratory, totals of 150–190 per female were deposited. Oviposition occurred over 60 days in 1955, and several females oviposited in the same pod, so that larvae of different ages developed together. The larvae hatched in 8–11 days and entered the seeds. There were normally three in each, but 1–7 were observed. For pupation, the larvae entered the upper soil and formed cells, in which they rested for 10–40 days before pupating. The pupal stage lasted 7–12 days during warm weather in 1951 and 15–29 at a lower temperature in 1955. Adults emerged from the beginning of August onwards and hibernated in the cells.

Some of the larvae died during moulting, and some were killed by older larvae in the same pod, by larvae of *Cydia* (*Laspeyresia*) *nigricana* (F.), or by unidentified diseases. Larvae and pupae in the soil were infested by *Beauveria* sp., and a species of *Entedon* described by G. Szelényi from adults of both sexes as *E. erdősi*, sp.n., was found to be parasitic on the larvae in their cells. A male and a female of this Eulophid emerged at the end of April 1956 from the cells of two larvae of *T. quinquepunctatus* taken in mid-August 1955.

Investigations on the degree of infestation showed that it averaged 33·5 per cent. for pods with 1–3 seeds and 66·5 per cent. for those with 4–9 seeds; late-sown peas maturing in September escaped infestation.

Szirmai (J.). **Hazai tapasztalatok a cukorrépa vírusos sárgaságának elterjedéséről és leküzdésének módjairól.** [Observations on the Distribution and Control of Sugar-beet Virus Yellows.]—*Ann. Inst. Prot. Pl. hung.* **7** (1952–56) pp. 393–407, 5 figs., 13 refs. Budapest, 1957. (With Summaries in Russian & German.)

In its spread eastward from western Europe, the virus of sugar-beet yellows reached Hungary in 1952. Observations in 1953 showed that

infection was 59·3 per cent. in seed beets, 27·8 per cent. in stecklings and 30·2 per cent. in commercial crops. The main vector was *Aphis* (*Doralis*) *fabae* Scop., and *Myzus persicae* (Sulz.) was seldom involved. The main source of the virus was seed beets, which were heavily infested. The Aphids appeared in mid-April, reached their numerical peak in early June and disappeared at the end of that month. Virus infection increased parallel with the aphid population, and was in inverse ratio to the distance from seed beet up to about a kilometre, after which there was a sharp decline.

Bognár (S.). **Notes on** *Pristocera depressa* **Fabr. (Hym. Bethylidae), a new Parasite of the Wireworm.**—*Acta agron.* **7** fasc. 3 pp. 231–241, 10 figs., 10 refs. Budapest, 1957. (With Summaries in Russian & German.)

This paper is virtually identical with one already noticed [*R.A.E.*, A **45** 205], but includes the statement that wireworms [*Agriotes obscurus* (L.)] paralysed by females of *Pristocera depressa* (F.) live for periods ranging from 14 to as long as 49 days [which suggests that the 14–19 days of the earlier version was a misprint].

Russ (K.). **Eine neue Methode zur Erzielung massierter Eiablage von** *Cheimatobia brumata* **L. (Kleiner Frostspanner) und einige Beobachtungen über die Biologie der Falter.** [A new Method of inducing mass Oviposition of *Operophtera brumata* and Observations on the Biology of the Moths.]—*Pflanzenschutzberichte* **16** pt. 10–12 pp. 163–172, 2 figs., 9 refs. Vienna, 1956. (With a Summary in English.)

Eggs of *Operophtera* (*Cheimatobia*) *brumata* (L.) for use in tests of winter ovicides are usually obtained either directly from the crowns of infested trees or by trapping females, by means of adhesive bands, when they ascend the trunks to oviposit, but both methods are unsatisfactory. During 1954–55, a method was tested near Vienna on apple trees known to be heavily infested each year, in which two adhesive bands were attached to each of a number of trees and twigs nailed to the trunk just beneath them. Females oviposited readily on these, and counts of eggs on them after oviposition had ceased showed that the numbers laid per 6 in. of twig averaged 6·5, as compared with 0·1 on twigs in the crowns of unbanded trees.

Investigations on the habits of the adults were carried out at the same time, and the literature on them is reviewed [*cf. R.A.E.*, A **10** 253; **26** 52, 420; **27** 99; **43** 162]. In 1954, females were first trapped on adhesive bands on 18th October. Their numbers increased rapidly and became fairly high, reaching a peak on 10th November. The last were taken about 10th December. In 1955, the females appeared on 20th October and were only about a quarter as numerous as in the previous year. Their numbers increased gradually and reached a peak on 18th November. No females were observed after 7th December. Emergence in both years began during mild weather and was generally favoured by a predominance of such conditions, but minor variations in temperature had little effect. Frost occurred in 1955 soon after the beginning of emergence and delayed the increase in numbers. Rough, dead or dying wood was preferred for oviposition to smooth, healthy wood. Males were also counted on the bands in 1955, when they comprised 76 per cent. of all the adults caught. They appeared at about the same time as the females, but increased more rapidly in numbers and disappeared slightly earlier.

Tsvetkov (D.). **Experiments on the Control of** *Sitophilus* (*Calandra*) *granarius* **L. and** *Sitophilus* (*Calandra*) *oryzae* **L. by Means of Liquid and Gas Insecticides in empty Storehouses.** [*In Bulgarian.*]—*Selsk. Mis.* 1957 pt. 9 suppl. (*Nauch. Trud. Minist. Zemed.* Ser. Rast. **2** pt. 5) pp. 11–28, 7 graphs, 39 refs. Sofia, 1957. (With Summaries in Russian & English.)

The control of *Calandra* (*Sitophilus*) *granaria* (L.) and *C.* (*S.*) *oryzae* (L.) in empty granaries was investigated in experiments carried out in Bulgaria over five and three years, respectively. Of the several insecticides tested in sprays, parathion gave the best and most rapid results. It should be applied at 0·06–0·12 g. per sq. metre of surface for the best effect. Corresponding rates for DDT and BHC are 1·5–2 g. for suspensions and 0·9–1·2 g. for emulsified solutions, but *C. granaria* was not very susceptible to DDT, and BHC left a disagreeable odour. Treatment should be carried out 2–3 weeks before grain is introduced, and, if DDT or parathion is used, the walls should subsequently be sprayed with a 20 per cent. solution of calcium hydroxide and the floor washed with water, for the neutralisation of toxic residues. Fumigation was also effective, and the recommended treatments are 100–150 oz. carbon bisulphide or sulphur dioxide per 1,000 cu. ft. or 10–20 oz. hydrogen cyanide for 24–48 hours or 20–25 oz. chloropicrin for 48–72 hours, although reduced amounts and shorter exposures are effective if the premises can be hermetically sealed. The temperature should be above 12°C. [53·6°F.].

Popova (V.). **Morphological and biological Investigations on** *Etiella zinckenella* **Tr. and its Control.** [*In Bulgarian.*]—*Selsk. Mis.* 1957 pt. 9 suppl. (*Nauch. Trud. Minist. Zemed.* Ser. Rast. **2** pt. 5) pp. 29–48, 12 figs. Sofia, 1957. (With Summaries in Russian & English.)

Etiella zinckenella (Treitschke) is an important pest of leguminous crops throughout Bulgaria, particularly in dry years, and caused heavy losses of beans in 1950. All stages of this Pyralid are described, and an account is given of investigations on its bionomics and control, carried out in 1953–55 in the laboratory and field. Various leguminous plants were used, and the following is based on the author's summary of the results. The eggs are laid singly or in small groups on the immature pods and hatch in 3–16 days. The larvae enter the pods and feed on the seeds, the larval stage lasting 23–32 days in summer and 180–200 in winter. The pupal stage, which is passed in the soil, lasts 26–29 days in summer and 31–53 in winter. Adults are present between the end of April and October, the two sexes occurring in equal proportions. Males survive for 10–35 days and females for 14–30. Good control was given by emulsion sprays of 0·2 per cent. DDT or 0·08 per cent. parathion, suspensions of 0·4 per cent. DDT, and a 5 per cent. DDT dust, applied three times at intervals of eight days. Early sowing reduced the damage on beans and peas. Parasites afforded little control; those observed are briefly noted.

Viel (G.) & Catelot-Goldman (C.). **Efficacité sur** *Ceratitis capitata* **Wied. des fumigations des pêches au dibrométhane.**—*Phytiat.-Phytopharm.* **6** no. 1 pp. 15–17, 2 refs. Paris, 1957.

Viel (G.) & Gusse (J. F.). **Fixation du dibrométhane par les pêches et les abricots traités par fumigation avec ce produit.**—*T. c.* pp. 19–22, 7 refs.

In the first of these papers, the results are given of tests in France on the efficacy of fumigation with ethylene dibromide for the control of larvae of

Ceratitis capitata (Wied.) in peaches. Fruits infested with larvae of various ages, ranging from those newly hatched to those ready to pupate, were exposed to fumigation with 20 oz. ethylene dibromide per 1,000 cu. ft. for two hours at 20–25°C. [68–77°F.], with preliminary vacuum, and complete mortality was obtained in every test.

In the second paper, investigations are recorded on the residues of ethylene dibromide and fixed bromine remaining on the fruits when peaches and apricots were subjected to the fumigation treatment. Small amounts of ethylene dibromide were found for the first two days after fumigation, rather more on apricots than on peaches, but this was then replaced by fixed bromine, which was present in amounts less than those occurring naturally in some vegetables.

Hurpin (B.) & Maillard (J.). **Détermination au laboratoire des doses d'emploi du chlordane, de l'heptachlore et du parathion pour la lutte contre les vers blancs.**—*Phytiat.-Phytopharm.* **6** no. 1 pp. 31–34. Paris, 1957.

In further tests in France on the toxicity of contact insecticides to larvae of *Melolontha melolontha* (L.) [*cf. R.A.E.*, A **46** 7], second- and third-instar larvae were kept in treated soil in aluminium boxes and in pots, respectively, at about 16°C. [60·8°F.], with pieces of carrot as food, and mortality percentages were calculated according to Abbott's formula [*cf.* **13** 331] weekly for up to six weeks. For the second-instar larvae, aldrin gave complete kill in three weeks at 2·7 lb. per acre, chlordane in 4–6 weeks at 4·5–6·3 lb. per acre, heptachlor in 2–3 weeks at 2·25–2·7 lb. per acre and parathion in 1–2 weeks at 1·8–4·5 lb. per acre. The third-instar larvae were less susceptible; aldrin gave 90 per cent. kill in six weeks at 2·7 lb. per acre, heptachlor 81 per cent. in 5–6 weeks at 1·8–2·7 lb. per acre, chlordane 64 and 88 per cent. in six weeks at 4·5 and 6·3 lb. per acre, and parathion complete kill in three weeks at 1·8 lb. and in two weeks at 3·6–4·5 lb. per acre.

Schvester (D.) & Rives (M.). **Résultats d'essais de traitement sur haricots contre la mouche des semis** *Hylemyia cilicrura* **Rond.**—*Phytiat.-Phytopharm.* **6** no. 1 pp. 35–41, 7 refs. Paris, 1957.

Preliminary experiments were carried out in France in 1956 on the value of insecticides in protecting bean seedlings from attack by *Hylemyia cilicrura* (Rond.). In the first, the beans were sown on 17th April and an aldrin emulsion spray was applied at a rate affording about 0·5 oz. aldrin per 100 yards of double furrow, after which the furrows were closed. Bad weather delayed and reduced germination, but only 2 per cent. of the seedlings were attacked by *H. cilicrura* in the treated plot, as compared with 60·6 per cent. for no treatment. In the second, seed coatings were applied by mixing wettable powders with the seed and then adding a 2 per cent. solution of methyl cellulose, with further mixing, and an organic fungicide was included in the mixture. The seed was sown on 3rd May, germination was good, and the percentages of seedlings attacked by *H. cilicrura* were 0·27, 0·28 and 0·41 for aldrin at 0·025 per cent., heptachlor at 0·05 per cent. and γ BHC (lindane) at 0·0255 per cent., respectively, by weight of seed, as compared with 3·72 for the fungicide alone and 2·35 for no treatment. All insecticide treatments were significantly superior to these last, with no significant differences between them.

Frezal (P.). **Action comparée du DDT et des formules insecticides et attractives sur la mouche des fruits** (*Ceratitis capitata* **Wied.**).—*Phytiat.-Phytopharm.* **6** no. 1 pp. 43–48. Paris, 1957.

In view of the successful use of yeast hydrolysate as an attractant in bait-sprays for the control of *Ceratitis capitata* (Wied.) in various parts of the world [*cf. R.A.E.*, A **41** 143; **45** 259], its value in Algeria was tested in 1956. Plots were established in a peach orchard situated close to another of an earlier-ripening variety, which ensured adequate infestation, and bait-traps containing 3 per cent. diammonium phosphate were hung in them. Counts of the adults taken were made every two days, and the liquid was renewed every week and replenished as necessary. Sprays containing 1·25 lb. malathion with 50 lb. sugar or 25 lb. yeast hydrolysate per 100 gal. were applied to a patch on the south side of trees in two series, and others containing 2·5 lb. DDT alone or 1·25 lb. malathion with 50 lb. sugar or 5 lb. yeast hydrolysate per 100 gal. to the whole of the crowns of trees in three others. All sprays were applied on 17th and 25th July and 4th and 9th August, and the fruits were gathered between 10th and 29th August and examined. The percentages infested averaged 5·88, 5, 2·57, 4·86, and 6·14 for the five spray mixtures, respectively, as compared with 9·97 for the untreated plots. Statistical analysis of these results indicated that all the sprays gave highly significant control and that DDT was significantly superior to the other materials. However, the low degree of fruit infestation on the untreated trees, as compared with a neighbouring untreated planting, and the fact that fewer adults were taken on the untreated trees and far fewer on those sprayed with DDT than on those treated with an attractant (sugar or hydrolysate) suggested that the latter had an effect on the distribution of the adults throughout the orchard, and that the DDT may have had a repellent effect. The comparative effectiveness of the treatments was therefore not accurately reflected in the percentages of fruits infested. The apparently high attractiveness of some of the sprays suggested that it might be possible to protect fruits in a susceptible stage of ripeness by applying bait-sprays to neighbouring trees of which the crop has already been gathered or has not yet reached the susceptible stage, and as the last two spray dates used in the tests were too close to harvest to conform with legal requirements in Algeria, this would facilitate control operations.

Vayssière (P.). **Monophlébines nuisibles au cotonnier et à l'arachide en Afrique** (**Homoptera, Coccidae**).—*Bull. Inst. Sci. nat. Belg.* **33** no. 13 pp. 1–8, 4 figs. Brussels, 1957.

Vrydagha lepesmei, gen. et sp.n., is described from the adult female and nymphs of all three instars and recorded on cotton in the Belgian Congo and the Ivory Coast. It occurs on the roots, in association with fungi, and is fostered by large ants of the genus *Camponotus*. It also infests groundnuts, maize and *Imperata cylindrica*, a common grass, in the Belgian Congo. Cotton is attacked principally when it is grown in infested soil, and the plants become unthrifty and are frequently killed, though their death is due partly to fungus attack. In the Belgian Congo, damage is sometimes severe in the south, especially in savannah regions abounding in *Imperata*, but the Coccid has also been found on this grass in the north, in the Ubangi savannahs.

A species of *Monophleboides* found on groundnuts in Ubangi is described from the adult female and first-stage nymph as *M. arachidis*, sp.n. It was associated with another Coccid, as yet unidentified, of which adults were not available.

Dempster (J. P.). **The Population Dynamics of the Moroccan Locust (*Dociostaurus maroccanus* Thunberg) in Cyprus.**—*Anti-Locust Bull.* no. 27, [3+] 60 pp., 3 pls., 21 figs., 30 refs. London, 1957.

The investigations described were carried out in 1953–55 in two areas near Nicosia as part of a scheme of research on *Dociostaurus maroccanus* Thnb. in Cyprus [*cf. R.A.E.*, A **40** 194]. One of the areas was an overgrazed site in the lowlands where the population density of *Dociostaurus* was permanently high, and the other was a low-density site in the foothills of the northern mountains. The topography and vegetation of the areas are described, and accounts are given of the methods employed for estimating population size for the different stages and of one developed by J. G. Skellam for separating the effects of movement and mortality on numbers. The following is partly based on the author's conclusions and relates largely to the high-density area.

The habitat of *D. maroccanus* in Cyprus is characterised by dry-steppe or semi-desert vegetation consisting of abundant annual plants that provide lush growth for a short period in early spring but have died by the beginning of summer. The adults appear when the vegetation is drying up and green food scarce. Eggs are laid in early summer, but do not hatch until the first warm days of spring, when green food is abundant, and the adults die with the onset of the summer drought. The dependence of the active stages on the short period when conditions are favourable makes numbers extremely sensitive to climatic variations. The average number of eggs laid per adult varied from 4·16 in 1953 to 14·02 in 1955 and is largely dependent on the date of adult emergence, which was three weeks later in 1953 than in 1955; the increased fecundity in the latter year was probably due not only to longer adult survival but, also, since both number of egg-pods and average number of eggs per pod showed an increase, to the fact that some green food was still available at the time of the first ovipositions. Variations in nymphal mortality (86–97 per cent.), duration of the nymphal stage (at least 38–46 days) and the date of the end of the adult period (16th–19th June) were not large, and their influence on the number of eggs laid was negligible. The date of hatching, which is far more variable and can influence fecundity considerably through its effect on adult emergence, is dependent on the weather in spring. In 1953, hatching was delayed by cool wet weather until the end of March, but in 1955 it began on 25th February, after unusually warm, dry weather, which destroyed nearly 30 per cent. of the eggs by desiccation; since mortality from other causes was low, that due to desiccation was greatly offset by the advantage of the early hatching date, though in other years its adverse effect might be considerable.

Of the natural enemies present [*cf.* **40** 195], *Systoechus autumnalis* (Pall.) and *Trichodes laminatus* Chevr. appeared to be the only ones to exert an important effect on numbers, though evidence was obtained that lizards greatly reduce populations in some years by attacking the ovipositing females. The larvae of *S. autumnalis* and *T. laminatus* feed on the eggs; those of the former show great specificity for them, and its numbers over the three years followed those of the egg-pods owing to increased larval survival when the average number of pods was high. Its influence varies directly with locust density, so that its overall effect is to limit the extent of the fluctuations in locust numbers. Since it has only one generation for each locust generation, its influence is delayed one year, and it cannot prevent large populations from occasionally developing. *T. laminatus* is also unable to prevent rapid variations in numbers and did not appear to be of regular importance in control, though it may be more so elsewhere, perhaps where food-plants for the adults are more abundant [*cf.* **33** 201]. A previous record of two species of *Thyridanthrax* having been reared from

the egg-pods in Cyprus [**40** 195] is stated to be erroneous, though adults are known to occur there.

D. maroccanus occurs in many disconnected areas scattered throughout the Messaoria plain (up to a height of about 1,500 ft.), to which it is confined, but although populations fluctuate from year to year in all, they remain permanently small in some, whereas extremely high densities may be reached in others only a few miles distant, in which weather conditions are doubtless similar. The only constant feature of all the high-density sites is a mosaic of bare ground and long and short vegetation [*cf.* **40** 194, 195], which also occurs in other countries in areas in which swarms of *D. maroccanus* originate [*cf.* **33** 200, etc.], but which is modified or absent from the low-density sites. The mosaics provide for the different ecological requirements of the various stages [*cf.* **40** 195]. Changes in the relative extent of the components of the vegetation are likely sometimes to cause crowding and, in consequence, the development of gregarious behaviour in the locusts [*cf.* **46** 371], but the instability of the vegetation is probably even more important, since, after the death of the annual spring plants, the locusts tend to congregate on the surviving green vegetation, and this led in 1953 to the formation of hopper bands. The mosaic-type vegetation in most of the high-density sites has developed as a result of the destruction of the natural woody covering and subsequent overgrazing, and permanent control can be achieved only by its elimination.

Norris (M. J.) (Mrs. O. W. Richards). **Factors affecting the Rate of sexual Maturation of the Desert Locust** (*Schistocerca gregaria* **Forskål**) **in the Laboratory.**—*Anti-Locust Bull.* no. 28, [2+] 26 pp., 2 graphs, 16 refs. London, 1957.

The following is based almost entirely on the author's summary. The period from the beginning of the adult stage to the deposition of the first egg-pod (maturation time) in laboratory-bred adults of *Schistocerca gregaria* (Forsk.) kept in isolated pairs shows great variability, mainly owing to delayed maturation in the males, which results in the postponement of pairing and consequently of oviposition by the females [*cf. R.A.E.*, A **40** 400; **44** 151]. An investigation of the environmental factors responsible for the delay was made and is here described. The greatest variability of maturation time may occur within one batch of locusts, but there was a marked tendency for the incidence of delay to be greater in batches emerging in summer (April–September) than in those emerging in winter (October–March). The mean maturation time for all summer pairs was 53 and for all winter pairs 33 days. There was a particularly high incidence of delay in April–May and in September. The arrest in reproduction is established as a result of factors operating during hopper or early adult life [*cf.* **44** 151] and may persist long after conditions have become favourable for rapid maturation in younger adults. Temperature and relative humidity were not seasonally variable factors in these experiments and could not be responsible for the seasonal difference in maturation time. The most regular seasonal variable was day-length. The subjection of winter-emerging adults to an artificially extended photoperiod of 15 or 16 hours was shown to result in a high incidence of delayed maturation. Restriction of the photoperiod to seven or eight hours reduced the incidence of delayed maturation in summer-emerging adults. It is, therefore, probable that day-length is an important factor in determining the seasonal difference in maturation time. Actograph records showed that, even at constant temperature, the long days caused males to remain active for a longer period in the evenings, the cessation of activity being roughly determined by the time of sunset. Resumption of

activity in the morning was not affected by the time of sunrise. During the first eight days of adult life, males subjected to long photoperiod ate slightly more than those subjected to short photoperiod. The water content and state of growth of the grass feed fluctuated irregularly throughout the year and cannot be related to the broad seasonal difference in maturation time, although they may account for minor, non-seasonal differences between batches. It is, however, suggested that other, unidentified properties of the grass may be responsible for the April–May and September peak periods of delayed maturation. These coincide with the two periods when the growth of pasture is most rapid and when it is of most value in cattle feeding. The maturation time of pairs emerging in September was accelerated by feeding on grass cut in May or in January and kept until September in cold storage. Pairs fed on frozen May grass matured more rapidly than those fed on frozen January grass. Any delaying properties of May grass are therefore destroyed by cold storage. Partial starvation of the locusts failed to retard maturation and in one experiment slightly accelerated maturation in males. The usually rapid maturation of pairs emerging in winter was not affected by differences in mean relative humidity ranging from 41 to 68 per cent. The incidence of delayed maturation among summer-emerging pairs was sometimes reduced, although not eliminated, by the higher humidities. Some batches of pairs were, however, much more susceptible than others to the accelerating effects of high humidity, and the intervention of another factor (probably the food) is suspected.

In a discussion of the nature and possible function of delayed maturation, the author suggests that it represents a facultative diapause initiated by long photoperiod and preceded by the accumulation of fat reserves and a reduction in water content. The decline in feeding that normally occurs in males after two weeks was found to be delayed in slowly maturing individuals, and G. Cavanagh showed that delayed maturation was associated with a continuing reduction in water content. The facultative diapause prevents adults from maturing towards the end of a rainy season, at a time when the soil is dry or drying and unsuitable for the development of the eggs and young hoppers, and provides them with an opportunity for migrating to areas of rainfall [*cf.* **43** 384].

Beck (S. D.). **The European Corn Borer, *Pyrausta nubilalis* (Hübn.), and its principal Host Plant. VI. Host Plant Resistance to larval Establishment.**—*J. Insect Physiol.* **1** no. 2 pp. 158–177, 3 pp. refs. London, 1957.

The following is virtually the author's abstract of this part of a series [*cf. R.A.E.*, A **46** 458, etc.]. A study was made in Wisconsin of the rôle of growth-inhibiting chemical factors in the resistance of certain dent maize inbreds to the establishment and survival of larvae of *Pyrausta nubilalis* (Hb.). The inbred lines employed were WF9, W204, W210D, W22, and W22RB. Total resistance factor activity, as determined by bioassay, was found to be in good agreement with resistance ratings of the inbreds as determined in field tests by other workers. It was found that the whorl tissues on which larvae of the first generation feed may contain high levels of ether-soluble resistance factors, but in most cases only low levels of ether-insoluble resistance activity. The chemical factor primarily responsible for resistance to leaf feeding was found to be Resistance Factor A (6-methoxy-2(3)-benzoxazolinone) [*cf.* **46** 458]. At the growth stage in which attack on the tassel occurs, the tassels of all the inbreds displayed very low resistance activity, and little or no intervarietal resistance was detected. After the open tassel growth stage, the internodes of W22 and

W22RB and the leaf sheaths of W22RB showed good intervarietal resistance activity. Other tissues tested, including ear structures, did not display appreciable varietal differences in resistance factor activity.

The relative resistance of early plant growth stages compared to later growth stages was termed intravarietal resistance, and some of its characteristics were determined. Resistance factor activity of whorl leaves of the borer zone was shown to decline as the tassel length increased. The activity in other borer-significant tissues did not necessarily decline as tassel length increased, however, and intravarietal resistance was not always at its maximum in the whorl stage of the different inbreds. It was shown that varietal differences in resistance factor activity were not explicable solely in terms of differences in resistance associated with the growth characteristics of the plant.

There appeared to be at least three chemicals contributing to the total resistance factor activity of the maize plant. Resistance Factor A was important in the resistance of early plant growth stages, but negligible after the development of a visible tassel. Resistance Factors B and C contributed about equally to the resistance factor activity found in internode, leaf-sheath, husks, and silk tissues. It was postulated that the resistance of maize to different parasitic organisms is caused by the same complex of chemicals responsible for resistance to *P. nubilalis*.

Kirk (V. M.). **Preplanting Treatment for Billbug Control on Corn.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 707–709, 2 refs. Menasha, Wis., 1958.

Large-scale field tests were carried out in South Carolina in 1956–57 to corroborate the results obtained in earlier small-scale tests of insecticides against *Sphenophorus* (*Calendra*) *maidis* Chitt. on maize [*cf. R.A.E.*, A **45** 191]. Broadcasting and disking in 5 lb. 40 per cent. wettable aldrin in 95 lb. fertiliser per acre between 21st March and 3rd April 1956, before sowing, reduced the loss of stand to 3·6–40·3 per cent. in 13 heavily infested fields, as compared with 83–96 per cent. in three untreated ones. This wide range in effectiveness was unexpected, but insectary tests showed that although a rate equivalent to 2 lb. aldrin per acre gave complete kill of *S. maidis* in loamy sand or loamy clay in four days, 16 lb. per acre was required in a sandy loam high in organic matter. It was considered possible that 4–8 lb. aldrin per acre would prove satisfactory in highly organic soils under conditions of longer exposure, and treatment of such soil with 4 lb. actual aldrin per acre in field tests was found as effective as treatment of light soil at 2 lb. per acre, all reducing the loss of stand to 0·1–1 per cent., as compared with 34–80 per cent. in untreated fields.

Graham (C.) & Krestensen (E. R.). **A residual Spray for Control of the Periodical Cicada.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 713–715, 3 figs., 4 refs. Menasha, Wis., 1958.

Adults of brood XIV of *Magicicada septendecim* (L.) emerged over a small area in Washington County, Maryland, in mid-May 1957, and some of the newer insecticides were tested for their control on trees in an apple orchard. Of these, Trithion [O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate], Tedion (2,4,5,4′-tetrachlorodiphenyl sulphone), Chipman R-6199 [hydrogen oxalate salt of O,O-diethyl S-2-(diethylamino)ethyl phosphorothioate], Nialate [O,O,O′,O′-tetraethyl S,S′-methylene bisphosphorodithioate (ethion)] (here referred to as methanedithiol, bis(O,O-diethyl

phosphorodithioate)), Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] and Sytam (containing schradan and tris-(dimethylamino)phosphine oxide) did not show rapid toxicity, but 2 lb. 50 per cent. wettable Sevin (1-naphthyl N-methylcarbamate) and 1 U.S. pint 25 per cent. Phosdrin [dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate] per 100 U.S. gal. each gave complete mortality of caged adults within 24 hours. The Sevin spray furthermore gave complete kill in 2–5 days of adults caged on the branches up to six days after treatment and some kill of those caged 1–2 days later, whereas Phosdrin showed no residual effect. In a small-scale test, spraying a tree with 2 lb. Sevin per 100 U.S. gal. gave complete control of adults emerging round it or flying in from adjacent areas for six days, but was ineffective after ten days, and in large plots, treatment with 2–6 lb. Sevin per 100 U.S. gal. protected apple trees completely for three weeks, with no apparent injury to the fruit or foliage [*cf. R.A.E.*, A **46** 448].

Steinhaus (E. A.). **Concerning the Harmlessness of Insect Pathogens and the Standardization of Microbial Control Products.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 715–720, 3 refs. Menasha, Wis., 1958.

The author considers that, although the micro-organisms that are pathogenic to insects and are used as active ingredients in control products in the United States are generally harmless to man, other vertebrates or plants, it is advisable and justifiable that products containing them should be subject to appropriate State and Federal regulations. He discusses the relevancy of the present laws and regulatory acts to the manufacture and distribution of such products, suggests provisional methods of standardising microbial insecticides and ensuring safety standards for them, and points out that standards of potency and safety should be based on scientific tests and maintained in such a way as to protect the public and yet not hamper the development of this promising method of insect control.

Johansen (C. A.), Coffey (M. D.) & Quist (J. A.). **Effect of Insecticide Treatments to Alfalfa on Honey Bees, including Insecticidal Residue and Honey Flavor Analyses.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 721-723, 1 fig., 12 refs. Menasha, Wis., 1958.

In further tests in 1954–55 on the effect on honey bees of insecticides applied to lucerne for control of the pea aphid [*Macrosiphum pisum* (Harris)] in the Yakima Valley of Washington [*cf. R.A.E.*, A **43** 252] 1 U.S. quart 22 per cent. demeton [diethyl 2-(ethylthio)ethyl phosphorothioate], 42 per cent. schradan or 25 per cent. parathion in 5 U.S. gal. spray per acre was applied to isolated plots of lucerne in flower, in which colonies of bees had been placed 3–15 days before. Comparison with colonies in untreated plots, in which mortality was low, showed no increase in numbers of dead bees after treatment with demeton or schradan and no difference in the amount of honey produced, whereas 159 and 1,006 dead bees, respectively, were found in the first and 41 and 113 in the second period of 24 hours after applications of parathion at 6.15 a.m. and 3.45 p.m., and honey production was slightly reduced.

Honey produced during the first week after the application of schradan at 6.30 a.m. contained 0·61 part per million of insecticide, but no other sample contained more than 0·18 p.p.m. of any of them, and these quantities are considered negligible, since honey would not normally be removed at

such short intervals and the bees would not be forced to forage in only one field. Analysis by a cholinesterase-inhibition method showed demeton residues on the plants of up to 77 p.p.m. after three weeks, and up to 22·8 p.p.m. after six. Schradan residues, analysed colorimetrically, averaged 0·39 p.p.m. after three weeks and 0·14 p.p.m. after six, and parathion residues 0·04 p.p.m. after 3–6 weeks, except in one sample, which yielded 0·46 p.p.m. after three weeks. No significant effects on flavour were detected.

Observations indicated that the bees were strongly repelled by demeton for 24 hours and by parathion for a shorter period. Schradan caused no unusual activity.

Swenson (K. G.). **Transmission of Bean Yellow Mosaic Virus by Aphids.** —*J. econ. Ent.* **50** (1957) no. 6 pp. 727–731, 23 refs. Menasha, Wis., 1958.

Experiments are described in which 17 species of aphids were tested in Oregon for ability to transmit the bean yellow mosaic virus, of which several aphids, including *Myzus persicae* (Sulz.) and *Macrosiphum pisum* (Harris) had previously been shown to be experimental vectors [*cf. R.A.E.*, A **43** 427–428]. Leguminous plants were used as the source of the virus and as the healthy indicator plants, the feeding period on the former was usually 15–60 minutes and groups of 20 aphids per plant were transferred to the healthy plants and allowed to feed for an hour or more. *Amphorophora* sp., *A. lactucae* (L.) (*sonchi* (Oestl.)), *Anuraphis tulipae* (Boy.), *A.* (*Aphis*) *cardui* (L.), *Aphis fabae* Scop., *A. gossypii* Glov., *A. helianthi* Monell, *Capitophorus fragaefolii* (Ckll.), *Hyalopterus atriplicis* (L.), *Macrosiphum barri* Essig, *M. avenae* (F.) (*granarium* (Kby.)), *M. rosae* (L.), *M. solanifolii* (Ashm.), *M. solani* (Kalt.), *Myzus cerasi* (F.) and *M. certus* (Wlk.) all transmitted the virus to some extent, and tests to compare the efficiency of transmission of four species showed that *M. persicae* was the most effective, *Macrosiphum pisum* and *Anuraphis tulipae* progressively less so and *Amphorophora lactucae* rather ineffective. The only aphid that failed to transmit in all tests was *Brevicoryne brassicae* (L.) [*cf. loc. cit.*].

The implications of this wide range of vector species are discussed with reference to the field infection of beans and *Gladiolus*, in which the virus is widespread. It is not transmitted through the seed of the former, and is thus introduced into a crop by winged aphids, but persists in the corms of the latter and is spread in a crop by aphids. In both cases, the aphids concerned may include many that do not breed on these plants.

An unexpectedly low rate of aphid transmission was found in tests with one isolate of the virus maintained in broad bean (*Vicia faba*), none being effected by the last 2,030 insects used, although three species of aphids and several combinations of virus source and indicator plants were tested, and it is concluded that the isolate had lost its aphid transmissibility [*cf.* **45** 136], possibly as a result of mutation in the plant host.

Butler (L. I.) & Westlake (W. E.). **Demeton Residues on Fruits, Vegetables, and Forage Crops.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 737–739, 2 refs. Menasha, Wis., 1958.

The results are given of analyses of fruits, vegetables or leaves for residues of demeton [diethyl 2-(ethylthio)ethyl phosphorothioate] resulting from field applications of sprays in the north-western United States in 1953–55. The

methods used are described. Only small amounts were found in fruits, roots or tubers, and most of the residue was concentrated in the leaves, especially in those of apple, with little or no movement to new growth after the first few days.

Paschke (J. D.) & Sylvester (E. S.). **Laboratory Studies on the toxic Effects of** *Therioaphis maculata* **(Buckton).**—*J. econ. Ent.* **50** (1957) no. 6 pp. 742–748, 6 figs., 6 refs. Menasha, Wis., 1958.

The following is based almost entirely on the authors' summary. In view of reports that *Therioaphis maculata* (Buckt.) damages lucerne by injecting a toxin while feeding [*cf. R.A.E.*, A **45** 426], greenhouse experiments were carried out in California with single apterae of this aphid and their progeny, feeding for one week on lucerne seedlings bearing the cotyledons and first monofoliate leaf. Individual plants varied both qualitatively and quantitatively in their reaction, but it appeared that although single aphids did not kill the plants under the conditions tested, the populations resulting seven days after infestation with a single female could kill very susceptible plants of the African variety. Yellow vein-banding usually occurred within 48 hours of infestation, and local chlorotic areas on infested leaves, leaf drop, stunting, wilting and necrosis developed later in response to continued attack. Either total petiole length or fresh green weight gave a suitable index of stunting, and the latter was used, as it was more rapidly determined. Infested and uninfested samples of seedlings could be separated statistically on the basis of fresh green weight 2–3 weeks after removal of the aphids. Correlation between severity of damage and the number of aphid-days of attack was weak, but the slope of the regression line was negative and statistically separable from zero. The inherent ability of the insects to induce the disease, the subsiding of symptoms after removal of the aphids and the brevity of the incubation period indicated that a toxin was injected. Populations of 0–35 were obtained, and maximum nymphal production and maximum dispersal of aphids from infested plants occurred 4–5 and 7 days after infestation, respectively.

Forgash (A. J.). **The inhibitory Effect of Arsenic Trioxide on the reduced Glutathione (GSH) of several Tissues of** *Periplancta americana* **(L.).**—*J. econ. Ent.* **50** (1957) no. 6 pp. 750–752, 7 refs. Menasha, Wis., 1958.

The following is based on the author's summary. A study was made of the effects of arsenic trioxide on reduced glutathione (GSH) [*cf. R.A.E.*, A **40** 102] in the muscle, fat-body, internal genitalia and alimentary canal of the adult American cockroach (*Periplaneta americana* (L.)). The GSH concentrations in the different tissues varied considerably; the highest concentrations (based on total dry weight) appeared in the alimentary canal (2·66 mg. per g. in females and 3·28 mg. per g. in males), particularly in the mesenteron (3·32 mg. per g. in females and 3·9 mg. per g. in males). The concentration in both muscle tissue and fat-body was about half that in the mesenteron. The internal genitalia contained smaller amounts. The greatest decreases in GSH following injection of solutions of arsenic trioxide occurred in the muscle and, particularly, in the fat-body. The great decrease of GSH in the fat-body, coupled with the fact that the female contains about eight times as much fat-body as the male, may explain the higher tolerance of the female to arsenic [*cf.* **45** 95].

Bartlett (B. R.). **Biotic Factors in natural Control of Citrus Mealybugs in California.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 753–755, 1 graph, 3 refs. Menasha, Wis., 1958.

The following is based on the author's summary. Injury by *Planococcus* (*Pseudococcus*) *citri* (Risso) has become more severe on *Citrus* in parts of southern California in recent years, and localised outbreaks of the mealybug are often associated with destruction of its natural enemies by DDT drifting from adjoining cultivated areas. A seasonal evaluation of the effectiveness of the natural enemies of the mealybug was made in 1955–56 by associating their natural abundance with the increase or decline of mealybug populations in three areas, comprising one in which natural enemies remained undisturbed, one in which certain natural enemies were restricted by surrounding the untreated plot with a barricade of trees sprayed with DDT, and a third in which natural enemies were restricted by direct application of DDT to the trees. The seasonal changes in mealybug populations and the associations of natural enemies in the three plots showed that *Cryptolaemus montrouzieri* Muls. was a very effective predator at high host densities and that the Encyrtid parasite, *Leptomastidea abnormis* (Gir.), caused a decrease in numbers at periods of low host density. The effectiveness of *Chrysopa plorabunda* Fitch could not be evaluated, as it is not susceptible to DDT, and little or no reduction in *P. citri* could be attributed to other predators, including *Leucopis bella* Lw., *Hyperaspis lateralis* Muls., *Scymnus sordidus* Horn and *Sympherobius californicus* Banks.

Hamilton (D. W.) & Cleveland (M. L.). **Control of the Codling Moth and other Apple Pests with Ryania.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 756–759, 1 fig. Menasha, Wis., 1958.

Sprays of 6 lb. ryania, 1 lb. DDT and 3 lb. lead arsenate per 100 U.S. gal. gave 99, 95 and 74 per cent. reduction, respectively, in the numbers of larvae of *Cydia* (*Carpocapsa*) *pomonella* (L.) and 95, 50 and 9 per cent. reduction in total injuries per 100 apples in eastern New York in 1945, and in 1953, when DDT seemed to be less effective [*cf. R.A.E.*, A **44** 384], a single field application of 6 lb. ryania per 100 U.S. gal. (activated with 3 per cent. propyl isome [di-n-propyl 6,7-methylenedioxy-3-methyl-1,2,3,4-tetrahydronaphthalene-1,2-dicarboxylate]) gave good control and compared fabourably with 2 lb. 50 per cent. wettable DDT per 100 U.S. gal. in immediate and residual effect on fruits brought into the laboratory for infestation.

In small-plot tests in Indiana in 1954–55, activated ryania was more effective than DDT in preventing entries, but less so in preventing superficial injuries, when applied 7–9 times from the first or second cover spray; ryania with oil and fixed nicotine was more effective than either in preventing both types of damage. In laboratory tests, neither ryania nor DDT had much effect on eggs or adults. Both materials were less effective than a spray of DDT and parathion against *Conotrachelus nenuphar* (Hbst.), *Quadraspidiotus* (*Aspidiotus*) *forbesi* (Johnson) and *Eulia* (*Argyrotaenia*) *velutinana* (Wlk.) and resulted in heavy infestations of mites in field plots in 1955; the addition of fixed nicotine, alone or with oil, to ryania tended to prevent mite increase. In 1956, 6 lb. pure ryania per 100 U.S. gal. gave good control of *Cydia pomonella*, *Conotrachelus nenuphar* and *E. velutinana* and, when preceded by a dormant application of an emulsion of oil containing DNC, of *Panonychus ulmi* (Koch), but was less effective than DDT with malathion in a young orchard. In a mature orchard, both ryania and DDT with parathion were unsatisfactory, owing to poor spray coverage;

Erythroneura lawsoniana Baker became numerous in the ryania plot and caused a moderate degree of leaf mottling. Incomplete data indicate that natural enemies were more abundant in the ryania plots than in those treated with DDT and parathion or DDT and malathion.

Adkisson (P. L.). **The relative Susceptibility of the Life History Stages of the Rice Weevil to certain Fumigants.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 761–764, 8 refs. Menasha, Wis., 1958.

The following is substantially the author's summary. Details are given of experiments in which samples of wheat containing individuals of *Calandra* (*Sitophilus*) *oryzae* (L.) almost all of one instar or stage were obtained, fumigated for 24 hours with carbon tetrachloride or ethylene dichloride, and examined for assessment of the LC50's, which are given in a table. Those for carbon tetrachloride indicated that the eggs, fourth-instar larvae and pupae were the most and the free adults the least resistant to this fumigant and that the third-instar larvae were more and the first- and second-instar larvae less resistant than newly emerged adults that had not yet left the grains; the slopes of the curves indicated that the first and second larval instars were the most sensitive to changes in concentration. The LC50's for ethylene dichloride showed that the third-instar larvae were the most resistant, followed by the eggs and first- and second-instar larvae, which were equally susceptible, and that the adults, pupae, fourth-instar larvae and newly emerged adults were the least resistant, with no differences between them; the slopes of the curves suggested that the eggs and then larvae in the first, second and third instars, in that order, were more sensitive to changes in concentration than the later stages. Ethylene dichloride was considerably more toxic than carbon tetrachloride to all stages of the weevil.

Nirula (K. K.). **Observations on the Green Muscardine Fungus in Populations of *Oryctes rhinoceros* L.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 767–770, 20 refs. Menasha, Wis., 1958.

The author describes the symptoms caused by the long-spored form (var. *rhinoceros*) of *Metarrhizium anisopliae* in larvae, pupae and adults of *Oryctes rhinoceros* (L.), a pest of coconut on the west coast of India [*cf. R.A.E.*, A **45** 210, etc.], and gives a table showing the percentages of natural infestation by this fungus observed during each month in 1956, with the corresponding meteorological records. The fungus was prevalent from May to October, when the relative humidity was above 70 per cent., the temperature about 27°C. [80·6°F.] and the sky overcast for more than half the time, and it is considered possible that epizootics might be initiated by artificial dissemination during the south-west monsoon period.

McEwen (F. L.), Schroeder (W. T.) & Davis (A. C.). **Host Range and Transmission of the Pea Enation Mosaic Virus.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 770–775, 34 refs. Menasha, Wis., 1958.

Pea enation mosaic, which is transmitted efficiently by *Macrosiphum pisum* (Harris), is the most important of the virus diseases of peas in western New York, and experiments on its control by control of the vector have shown promise [*cf. R.A.E.*, A **43** 213], but inconsistencies were observed,

and investigations were carried out to obtain further information on the range of plants in which the virus might overwinter and its relation to the vector [*cf.* **43** 274–275]. The following is based on the authors' summary of the results.

Greenhouse experiments showed that several annual and perennial leguminous plants common in pea-growing areas of New York were susceptible to the virus. Crimson clover [*Trifolium incarnatum*], common vetch (*Vicia sativa*) and hairy vetch (*V. villosa*) were readily infected by *M. pisum*, yellow sweet clover (*Melilotus officinalis*) and white sweet clover (*M. alba*) were less susceptible, and lucerne, wild white clover (*T. repens*), ladino clover [*T. r. latum*] and alsike clover (*T. hybridum*) were infected in only a small proportion of tests. The availability of the virus to the aphid in these hosts closely paralleled the ease with which they were infected.

In the transmission of the virus from pea to pea by *Macrosiphum pisum*, the minimum acquisition feeding period was two hours; feeding for five minutes sufficed to produce infection of healthy plants, and the minimum total transmission period was 24 hours. Although visible symptoms of infection did not appear on the plants for 7–9 days, the virus was readily available to the aphid after 3–5 days.

A parathion spray was of no significant value in protecting pea plants from infection by viruliferous aphids left on them for 24 hours, one, two or three days after its application.

McEwen (F. L.), Natti (J. J.), Hervey (G. E. R.) & Schroeder (W. T.). **The relative Effectiveness of various Insecticide-Fungicide Seed Treatments on Lima Beans after several Months Storage.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 775–777, 5 refs. Menasha, Wis., 1958.

Uniformly sized seeds of lima bean were coated with 0·125 or 0·25 oz. diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate], dieldrin or lindane [almost pure γ BHC] alone or in combination with 1, 2 or 4 oz. thiram [bis(dimethylthiocarbamoyl)disulphide] per bushel, applied in a slurry with 2 per cent. Methocel as adhesive, on 7th September 1955 for use in tests in New York of protection against *Hylemyia cilicrura* (Rond.) and fungi causing seed decay. Some of the seed was sown on 9th September, and that treated with both insecticide and fungicide or with fungicide only resulted in about 90 per cent. stand, untreated seed and that treated with dieldrin or γ BHC alone in about 70 per cent. stand, and that treated with diazinon alone in about 50 per cent. Infestation by *H. cilicrura* was variable.

The rest of the seed was stored in cloth bags in an unheated barn and sown in early May. Very few plants resulted from seed that had not been treated with thiram, and about 55 per cent. of those from seed not receiving insecticide were injured by *Hylemyia*. Diazinon was significantly more and γ BHC significantly less effective than dieldrin against the latter, and the higher dosage was significantly better than the lower for γ BHC and dieldrin but not for diazinon. The number of plants produced increased significantly with the dosage of thiram, but the differences were not of practical value.

Rabb (R. L.) & Lawson (F. R.). **Some Factors influencing the Predation of *Polistes* Wasps on the Tobacco Hornworm.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 778–784, 2 figs., 10 refs. Menasha, Wis., 1958.

The following is substantially the authors' summary. Investigations of several factors influencing the effectiveness of *Polistes exclamans exclamans*

Vier. and *P. fuscatus fuscatus* (F.) in the natural control of *Protoparce sexta* (Joh.) on tobacco were made near Clayton, North Carolina, in 1956. The seasonal variations in the abundance of the *Protoparce* larvae and those of other free-feeding species were reflected in the samples of prey taken from the wasps returning to their nests. *Plathypena scabra* (F.), although absent from prey samples in June, was one of the most numerous species taken in July and August; it decreased sharply after this, when three large fields of soy beans, on which it had been feeding, were ploughed under.

Within a distance of 800 ft. from tobacco, the percentage of *Protoparce* in the prey of *Polistes exclamans* was inversely proportional to the distance from tobacco; the same relation was not clearly demonstrated for *P. fuscatus*, which is slightly larger and apparently flies a greater distance than *P. exclamans*, but the recovery of marked wasps released in a tobacco field showed an inverse relation between distance and the numbers of both species. Most of the *Protoparce* larvae carried to the nests were in the third or fourth instars, but the wasps killed many smaller larvae without removing them. They inspected but usually did not kill fifth-instar larvae.

Polistes had little effect in reducing damage to tobacco by *Heliothis virescens* (F.) and *H. zea* (Boddie), which feed within the protection of terminal buds during their period of greatest economic importance, but caused large reductions in populations of *Protoparce*. Predators, chiefly *Polistes* spp., killed 68 per cent. of the latter in an experimental area, but, along with other natural enemies, failed to reduce the population below the economic level. This failure is not considered representative, however, because of the abnormally high *Protoparce* population and the paucity of natural nesting sites for *Polistes* near the tobacco. In addition, the abundance of alternative prey, particularly *Plathypena* on neighbouring soy beans, undoubtedly reduced the attack on *Protoparce*.

English (L. L.) & Snetsinger (R.). **The Biology and Control of** *Eotetranychus multidigituli* **(Ewing) a Spider Mite of Honey Locust.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 784–788, 3 figs., 6 refs. Menasha, Wis., 1958.

The honey locust, *Gleditsia triacanthos*, is being increasingly used as a shade and ornamental tree in the United States. It is comparatively free from disease and pests, but investigations in Illinois in 1955–56 showed that *Eotetranychus multidigituli* (Ewing) can damage it severely by feeding on the lower surfaces of the leaflets and causing them to turn yellow and drop prematurely.

All stages of this mite are described. In rearing tests in 1956, females deposited an average of 5·2 eggs per day, one laying 72 eggs in 11 days. The eggs hatched in 5–7 days, and the active and resting phases of the larval, protonymphal and deutonymphal stages commonly lasted about one day each. Development from egg to adult averaged 9·5 days in June and 14·6 days in September. Unfertilised eggs gave rise to males. The population reached a peak in July–August, and the females became almost inactive with the approach of cold weather, overwintered under rough bark at the base of twigs or under bud scales and died in spring after ovipositing on the twigs. Later in the year, the eggs were laid mainly on the leaves.

Stethorus punctum (Lec.), *Scolothrips sexmaculatus* (Perg.) and *Typhlodromus fallacis* (Garman) were observed preying on the mite; the last was the most numerous, but did not become abundant until July and failed to prevent heavy infestations. Sprays of 1 lb. 25 per cent. wettable malathion, 15 per cent. wettable Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite] or both per 100 U.S. gal., applied on 7th July 1955,

gave practical control for the rest of the season, and 1 U.S. quart 57 per cent. malathion emulsion concentrate per 100 U.S. gal. or 4 lb. 25 per cent. wettable malathion, alone or with 1 lb. 15 per cent. wettable Aramite or 25 per cent. wettable chlorobenzilate [ethyl 4,4′-dichlorobenzilate] per 100 U.S. gal., applied on 6th August 1956, eliminated the infestation.

DANIELS (N. E.). **Greenbug Populations and their Damage to Winter Wheat as affected by Fertilizer Applications.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 793–794, 6 refs. Menasha, Wis., 1958.

As various fertilisers are used in the High Plains area of Texas, where infestation of cereals by *Toxoptera graminum* (Rond.) is common, tests were carried out in 1956–57 to find the effect of certain combinations of them on the population of the aphid and on the damage that it causes to winter wheat. In greenhouse tests, potted plants, grown in soil to which fertiliser had been applied in a band one inch below and half an inch to the side of the seed row, were infested with two adults when about three inches high, and observations were made 30 days later. The fertiliser treatments tested comprised phosphorus (as treble superphosphate), nitrogen (as ammonium sulphate), these two together, the same two with potassium (as potassium chloride), and nitrogen with calcium sulphate (this last because calcium had been reputed locally to reduce aphid damage). The results showed fewer insects per unit weight of foliage, less plant damage and greater plant weight for treatments with nitrogen, except when it was combined with calcium sulphate [*cf. R.A.E.*, A **39** 276]; phosphorus and potassium appeared to have little effect.

In a field test, wheat was sown on 13th September, one day after the application of ammonium sulphate or treble superphosphate at a depth of six inches. Counts on 1st April showed that phosphorus had no effect on the aphid population or the weight of the foliage, whereas the numbers of *T. graminum* per g. foliage and per linear foot of row varied inversely and directly, respectively, with the amount of nitrogen applied (0, 80 or 160 lb. per acre). Nitrogen alone at 80 lb. and nitrogen at 80 and 160 lb. with phosphorus resulted in progressively greater foliage weights, and it is concluded that increases in plant size and vigour result in reductions of aphid populations and damage.

CLARK (E. W.). **Effect of Hot-water Treatment for hard Cottonseed on a Pink Bollworm Infestation.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 795–796, 1 graph, 5 refs. Menasha, Wis., 1958.

In some of the newer varieties of cotton, in which high proportions of the seeds germinate slowly and erratically, immersing them in hot water has been found to improve the plant stand produced. The effect of this treatment on larvae of *Platyedra* (*Pectinophora*) *gossypiella* (Saund.) [*cf. R.A.E.*, A **2** 218] was tested in the United States by immersing samples of 0·5–1 lb. infested seeds in water at temperatures of 130–180°F. for periods of 45, 90 or 120 seconds and then keeping them at 82°F. and 90–99 per cent. relative humidity for 7–14 days, after which they were examined for infestation. Complete mortality of larvae was obtained in seeds subjected to temperatures of 150–180°F. for at least 45 seconds, but not in those subjected to 140° or less, even for 120 seconds. Tests with thermocouples showed that it took 45 seconds for the centre of a solid linted seed and 35 seconds for one without lint immersed in hot water to reach the ambient temperature of

130°F. from room temperature (82°F.); the time was shorter for hollow seeds, and it is concluded that treatment for 45 seconds suffices to subject the larvae to a lethal temperature.

Wright (J. M.) & Decker (G. C.). **Insecticidal Control of the Carrot Weevil in Canning Carrots.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 797–799, 7 refs. Menasha, Wis., 1958.

The carrot weevil, *Listronotus oregonensis* (Lec.) [which was formerly misidentified as *Hypcrodes* (*L.*) *latiusculus* (Boh.) and of which *L. rudipennis* Blatchley is a synonym (*cf. R.A.E.*, A **20** 365)], caused severe injury to carrots grown for canning over a large area in northern Illinois in 1948. Investigations begun in 1949 showed that this weevil has two generations a year [*cf.* **26** 565; **31** 62]. The adults overwinter in grass verges near the fields, and become active and feed in the first week of May. Eggs are laid in cavities in the stems, crowns or exposed roots of the carrot plants from the last week in May, and the larvae feed and pupate in the soil. Adults of the first generation appear between mid-July and early August, and those of the second in late September or early October. Flight is apparently rare.

Soil treatment with 5–10 lb. chlordane or 0·5–1 lb. parathion per acre on 12th April, before the final disking, did not control the larvae in 1949, and sprays were tested against the adults in 1950–52. Four applications at 125 U.S. gal. per acre were directed to the stems of the plants over about a month from late May or early June, at the beginning of oviposition, and counts of damaged roots in July or August showed that DDT at 1 lb. and lindane [almost pure γ BHC] at 0·25 lb. per acre caused 79·1–86·7 and 77·1–93·3 per cent. reduction in injury and 0·5 lb. dieldrin and 0·3 lb. parathion about 68 and 42–85 per cent. reduction, whereas aldrin, chlordane, heptachlor, methoxy-DDT (methoxychlor) and toxaphene were less effective. Applications on 22nd June and 12th July of 1 and 2 lb. DDT in 50 U.S. gal. emulsion spray per acre, 1 lb. DDT in 40 lb. of a bait of apple pomace and calcium arsenate (95 : 5) [*cf.* **31** 62] or 40 lb. bait alone per acre reduced injury on 25th July by 68·4, 84·2, 84·2 and 31·6 per cent. and that on 3rd October by 83·1, 92·3, 89·2 and 9·2 per cent., respectively.

Since *Macrosteles fascifrons* (Stål), the vector of aster yellows in carrots, is a pest in Illinois, growers have used DDT to control both this and the weevil. Maximum practical control of the latter requires four spray applications of 1·5 lb. DDT per acre at 7–10 day intervals, beginning at the time of oviposition, usually in late May, when the carrots are 2–3 in. tall, and these also control *Macrosteles*.

Wilcox (J.) & Howland (A. F.). **Systemic Insecticides applied in low- and high-gallonage Sprays on Strawberry, Lima Bean, and Swiss Chard.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 800–801. Menasha, Wis., 1958.

Small-plot tests were carried out in southern California in 1955, in which systemic insecticides were applied in concentrated and dilute emulsion sprays with a high-pressure mist sprayer and a knapsack sprayer, respectively, for the control of *Tetranychus telarius* (L.) on strawberry and lima bean and of aphids on sea-kale beet (Swiss chard). Demeton and methyl-demeton [diethyl and dimethyl 2-(ethylthio)ethyl phosphorothioate, respectively] in concentrates containing 5 lb. per U.S. gal. and schradan in one containing 6·5 lb. per U.S. gal., applied at concentrations of 1 : 39, 1 : 49 and 1 : 31·5 in 5 or 10 U.S. gal. spray per acre on 14th March, kept the mite population below five per leaflet for more than four weeks and were more effective than

concentrates containing 4 lb. Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] or Am.Cyanamid 12008 [O,O-diethyl S-isopropylthiomethyl phosphorodithioate] per U.S. gal. at 1:159 or one containing 2 lb. Pyrazoxon (diethyl 3-methyl-5-pyrazolyl phosphate) per U.S. gal. at 1:79; all were much better than a concentrate containing 2 lb. Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] per U.S. gal. at 1:39, and the higher spray rate tended to be more effective than the lower. Similar results were obtained when dilute sprays at one-tenth of these concentrations were applied at 50 or 100 U.S. gal. per acre, and these tended to be more effective than the concentrated sprays in one test and less so in another.

When applied to lima beans in 5 U.S. gal. spray per acre on 2nd June, a concentrate containing 2 lb. demeton per U.S. gal. and the Pyrazoxon, methyl-demeton, Thimet, Am.Cyanamid 12008, schradan and Guthion concentrates at 1:24, 1:39, 1:39, 4:63 and 1:9, respectively, all caused highly significant reductions in numbers of mites per leaf and proportion of leaf surface damaged, and similar results were obtained from dilute sprays at one-tenth of these concentrations applied at 50 U.S. gal. per acre, except that Guthion was much less effective.

Sea-kale beet was sprayed on 20th October, when the plants had four leaves, and again on 9th November, when they had 6–8, and counts of aphids (*Myzus persicae* (Sulz.). *Aphis fabae* Scop. and *Macrosiphum* sp.) on 22nd and 30th November showed that concentrates containing 2 lb. Chemagro 102 (O,O-dimethyl S-2-(ethylthio)ethyl phosphorothioate [methyl-demeton-S]), Chemagro 103 (O,O-dimethyl S-2-(ethylsulphinyl)ethyl phosphorothioate) or Chemagro 104 (O,O-dimethyl S-2-(ethylsulphonyl)ethyl phosphorothioate) per U.S. gal. at 1:79 and the schradan concentrate at 1:64 were more effective than concentrates containing 2 lb. demeton, Isolan [1-isopropyl-3-methyl-5-pyrazolyl dimethylcarbamate] or Pyrazoxon or 4 lb. Thimet per U.S. gal. applied at 1:79, all in 10 U.S. gal. spray per acre; similar results were obtained with sprays at one-fifth of these concentrations applied at 50 U.S. gal. per acre, which tended to be more effective. Significant control was given by all materials except Guthion, which was useless in both tests.

Pfrimmer (T. R.). **Response of Insects to different Sources of Black Light.** —*J. econ. Ent.* **50** (1957) no. 6 pp. 801–803, 13 refs. Menasha, Wis., 1958.

In further tests at Tallulah, Louisiana, in 1955–56 of the attractiveness to Lepidoptera of ultraviolet light from a 15-watt BL fluorescent lamp, a 15-watt BLB fluorescent lamp and a 100-watt mercury-vapour lamp [*cf. R.A.E.*, A **44** 390; **45** 24], the combined collections of most of the species taken were considerably larger in 1955 than in 1956, when the traps were operated for shorter periods in the autumn and when phosphorus insecticides were first widely used on cotton. However, *Loxostege similalis* (Gn.) was nearly twice as numerous in the catches in the second year, although the mercury-vapour trap caught fewer than before. Most species were attracted in the greatest numbers to the BL trap in both years; the mercury-vapour trap was the most attractive of the three to *Celcrio lineata* (F.) and *Protoparce quinquemaculata* (Haw.) in 1955 and to the latter in 1956, and the BLB trap caught most of five species in 1956. Females predominated in more species in 1956 than in 1955 in all traps, but more than half of *Laphygma frugiperda* (J.E.Smith) and *Pseudaletia unipuncta* (Haw.) were females and more than half of *Protoparce sexta* (Joh.), *Estigmene acraea* (Dru.) and *Prodenia ornithogalli* Gn. males in all traps in both years. The

numbers of adults of *Heliothis zea* (Boddie) trapped showed a significant correlation with the numbers of eggs found on cotton in the next though not in the same week in 1955, but there was no significant correlation in 1956.

Mistric jr. (W. J.). **Chemical Control of** *Tetranychus telarius* **(L.) and** *T. cinnabarinus* **(Bois.) on Cotton.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 803–805, 4 refs. Menasha, Wis., 1958.

Although *Tetranychus atlanticus* McG., *T. tumidus* Banks, *T. schoenci* McG. and *T. desertorum* Banks all occurred on cotton in North Carolina in 1955–56, *T. telarius* (L.) and *T. cinnabarinus* (Boisd.) were the most prevalent. These two mites are the most difficult to control, and though sprays of demeton [diethyl 2-(ethylthio)ethyl phosphorothioate] are effective against them, most growers are not equipped with sprayers. Infestation became severe in Cleveland County in July 1956, and dusts were compared against them with a concentrate emulsion spray affording about 0·25 lb. demeton per acre on cotton that had been sown in April and treated several times with chlorinated hydrocarbons for control of the boll weevil [*Anthonomus grandis* Boh.], and, in one case, dusted with sulphur and parathion. When applied on 27th July against *T. cinnabarinus* and on 7th August against *T. telarius*, a dust of 4 per cent. Trithion [O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate], at 24–28 lb. per acre, was as effective as the demeton spray, both virtually eliminating all active forms for at least ten days; this apparently sufficed to disrupt the life-cycle, and populations did not regain their original level for the rest of the season. The same results were obtained with both 22 lb. 2 per cent. Trithion and 26 lb. 4 per cent. Trithion in a third test, in which applications were made against *T. telarius* on 24th August. Of the other dusts tested, 1 per cent. parathion, 5 per cent. Phostex [a mixture of bis(dialkyloxyphosphinothioyl) disulphides], 2·5 per cent. Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] and 3 per cent. Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite], though giving immediate reductions in population, permitted rapid reinfestation, necessitating repeated application at short intervals, and 5 per cent. Kelthane [1,1-bis(p-chlorophenyl)-2,2,2-trichloroethanol] and 3 per cent. Hercules AC-528 [2,3-p-dioxane S,S-bis-(O,O-diethyl phosphorodithioate)] were relatively ineffective; 2 per cent. Niagara 1240 [O,O,O′,O′-tetraethyl S,S′-methylene bisphosphorodithioate (ethion)], though superior to parathion, was less effective than Trithion against *T. telarius*. Defoliation occurred more rapidly on untreated than on treated plants, but all the treated plants except those receiving demeton or Trithion showed additional reddening of the leaves after treatment.

Nielson (M. W.) & Barnes (O. L.). **Life History and Abundance of the Spotted Alfalfa Aphid in Arizona.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 805–807, 1 graph, 5 refs. Menasha, Wis., 1958.

In investigations in southern Arizona in 1955–56, *Therioaphis maculata* (Buckt.) was reared on lucerne in the laboratory and in a lath house. The nymphs passed through four instars, and records for March–October showed that the duration of the nymphal stage varied from five days in June to 13 in March. Only 28 and 15 per cent., respectively, of the alate and apterous females lived for more than 30 days; they produced about the same number of young, at average rates of three and four per day, respectively, and reproduction was greatest in the first 17 days of adult life and correlated with temperature. The largest number of progeny per female

was 142, and there were probably at least 35 generations in 1955. Surveys in lucerne fields at intervals of 10–14 days in 1955 showed peaks of abundance of apterae in April and November and of alatae in April and December; in 1956, numbers were much smaller and showed no peaks, probably owing to the increasing use of insecticides.

Manglitz (G. R.) & App (B. A.). **Biology and seasonal Development of the Alfalfa Weevil in Maryland.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 810–813, 1 fig., 10 refs. Menasha, Wis., 1958.

The following is based on the authors' summary. Since *Hypera variabilis* (Hbst.) (*postica* (Gylh.)) was first observed in Maryland [*cf. R.A.E.*, A **41** 283], it has spread and caused great damage to lucerne. Observations on its bionomics and seasonal history were made in 1953–56. These showed that most of the eggs are laid in growing stems, but a few were found in dead ones. Oviposition began in autumn, was interrupted by cold weather and was resumed in spring, and the incubation period varied from four days for eggs laid in summer to 173 days for those laid in autumn, and was about two weeks for those laid in spring. Larvae began to appear in early April, pupae in early May and adults shortly before the time of the first hay cutting. Most of these did not oviposit until the autumn. There was some adult and larval activity on lucerne throughout the summer, and though there may be a partial second generation in the year, it can be of no importance, since the larvae and pupae are unlikely to be able to survive the winter in Maryland.

Stern (V. M.) & Reynolds (H. T.). **Developments in chemical Control of the Spotted Alfalfa Aphid in California, 1955–56.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 817–821, 8 refs. Menasha, Wis., 1958.

By January 1957, *Therioaphis maculata* (Buckt.) had been observed on lucerne from coast to coast in the United States [*cf. R.A.E.*, A **45** 327, etc.] and from central Wisconsin to far south in Mexico. It has rapidly become the most important pest of this crop in California. Parasites have been introduced for trial against it [*cf.* **46** 231], and insecticides are widely used for its control, but they afford only temporary alleviation and the aphid has developed resistance to parathion in some areas [*cf.* **46** 124]. Other insecticides were tested in the field in 1955–56 [*cf.* **46** 124], and the following is based on the authors' summary of the results.

Phosdrin [dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate] and Trithion [O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate] proved very effective. Trithion gave more than 99 per cent. reduction of the aphid population in 24 hours, as compared with untreated plots, when applied at 4·5–14 oz. per acre with a ground sprayer, and more than 95 per cent. in three days when applied at 2·9 oz. Duration of effectiveness was good at 8 oz., and at least 4 oz. per acre may be necessary for consistently good results. Trithion has little or no systemic action and a low vapour pressure, and good coverage is essential for maximum effectiveness. Phosdrin was not effective at 0·3 oz. per acre in sprays, but gave good control soon after application at 0·6–3·3 oz. per acre. It has a very high vapour pressure, and the vapour gives very effective mortality of the aphid if applications are made when temperatures are high and air movement slight. During periods in which flight of alates is heavy, it does not give control for more than 24 hours. Preliminary observations indicated that it

was toxic to many beneficial insects. Trithion appears preferable to Phosdrin on account of its greater residual toxicity, except when aphid control is necessary just before harvest.

Methyl-parathion and malathion at 5·8 and 13 oz. per acre, respectively, and parathion at 2·4 oz. in the Owens Valley gave satisfactory control, Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] at 5 oz. was slightly less effective, and 1·9 oz. R-7707 (O,O-diethyl S-2-(diethylamino)ethyl phosphorothioate), 3·2–3·6 oz. Chipman R-6199 [hydrogen oxalate salt of R-7707] and 9 oz. CP-11327 (O,O-dimethyl S-(2-propynyl) phosphorodithioate) were unsatisfactory.

Guthrie (F. E.), Ringler (R. L.) & Bowery (T. G.). **Chromatographic Separation and Identification of some Alkaloid Metabolites of Nicotine in certain Insects.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 821–825, 2 figs., 11 refs. Menasha, Wis., 1958.

The following is based on the authors' introduction and summary. Although numerous insects attack tobacco, practically nothing is known of the physiological mechanism that enables them to survive the relatively large quantities of nicotine that they must ingest. Preliminary investigations were therefore made on the metabolism of nicotine in adults of *Blattella germanica* (L.) and *Periplaneta americana* (L.) treated topically and larvae of *Laphygma* (*Prodenia*) *eridania* (Cram.) that ingested it on potato wafers. After extraction, the metabolites were separated by a technique of ascending paper chromatography and partially identified by comparative Rf values and ultraviolet absorption spectra. Cotinine was found to be the main metabolite in *Periplaneta*, and a compound thought to be quite similar to cotinine was found in *Blattella*. Several metabolites, as yet unidentified, were found in *Laphygma*.

Richardson (B. H.). **Control of Onion Thrips in the Winter Garden Area of Texas, 1957.**—*J. econ. Ent.* **50** (1957) no. 6 p. 828, 3 refs. Menasha, Wis., 1958.

In the first of two tests in 1957 of insecticides for the control of *Thrips tabaci* Lind. on onion in the Winter Garden area of Texas [*cf. R.A.E.*, A **46** 349], treatment with 0·25 lb. parathion, methyl-parathion or Phosdrin [dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate] or 1·25 lb. malathion in 21 U.S. gal. spray per acre on 28th February caused 73–85 per cent. reduction in thrips populations one day after application, whereas 0·5 lb. diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate], Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate], Dow ET-15 [O-methyl O-2,4,5-trichlorophenyl phosphoramidothioate] and Dow ET-57 [O,O-dimethyl O-2,4,5-trichlorophenyl phosphorothioate] were less effective; all insecticides gave 72·8–95·3 per cent. reduction after four days, but were relatively ineffective after seven, possibly because rain fell in the interim. In a second test, 0·5 lb. Chlorthion [O,O-dimethyl O-3-chloro-4-nitrophenyl phosphorothioate] and combinations of 0·38 lb. dieldrin with 0·25 lb. parathion or 0·625 lb. malathion or of 2 lb. Perthane [1,1-bis(p-ethylphenyl)-2,2-dichloroethane (ethyl-DDD)] with 0·625 lb. malathion in 21 U.S. gal. spray per acre gave 72·1–76·1 per cent. reduction in one day, and the first two gave 81·1 and 85·2 per cent. reduction after four days and 63·1 and 83·5 per cent. after seven, whereas the others

were less effective. Trithion [O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate] at 0·5 lb. and a mixture of 0·625 lb. malathion with 2 lb. ethyl-DDD did not give such good results, and 0·5 lb. dieldrin or heptachlor and 2 lb. ethyl-DDD alone were ineffective. A mixture of BHC with DDT gave poor control, indicating resistance to this combination [*cf. loc. cit.*], and it is concluded that organic phosphates are the best materials for use against *T. tabaci* in the area.

Freeman (C. C.) & Guyton (F. E.). **A Method for rearing Leaf-mining Agromyzidae.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 829–831, 3 figs., 6 refs. Menasha, Wis., 1958.

A description is given of a method by which Agromyzids that mine in the leaves of beans and tomato were reared on these plants in the laboratory in Alabama. Folded and rolled sheets of paper towelling inserted into 20 per cent. sugar solution in the cages formed a relatively wet surface on which the adults could feed, and the infested leaves were removed about a day before the larvae became full-fed and transferred to a receptacle containing a solution of a liquid plant food, to facilitate collection of the pupae. Comparisons of groups of adults confined on plants with and without sugar solution showed that the latter was essential for survival of most of the flies for more than a day.

Wolfe (H. R.). *Dorilas* (*Eudorylas*) *subopacus* (**Loew**), **a Parasite of the Leafhopper,** *Scaphytopius acutus* (**Say**).—*J. econ. Ent.* **50** (1957) no. 6 p. 831, 1 ref. Menasha, Wis., 1958.

Since about 1947, nymphs and adults of *Scaphytopius acutus* (Say), one of the principal vectors of the virus that causes western X-disease of peach and cherry in Washington [*cf. R.A.E.*, A **42** 159], have been collected from lucerne in the field in June–September for rearing. Dipterous parasites, identified as *Dorilas subopacus* (Lw.), emerged in the rearing cages in 1953–56. The eggs of this Pipunculid are deposited and the larvae develop in the abdomen of the host, and the full-fed larvae break out, killing the host, and drop to the ground to pupate. Parasitised Cicadellids were collected only from an area between Monitor and Wenatchee, and observations in the four years showed no indication that the parasite was either spreading or increasing in numbers; the population of *S. acutus* in the infested area also varied little during this period.

Beckham (C. M.) & Tippins (H. H.). **The Effectiveness of several Insecticides against the Vegetable Weevil.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 832–833, 3 refs. Menasha, Wis., 1958.

Listroderes costirostris obliquus Klug is a pest of autumn and winter vegetables in Georgia. It is particularly injurious to turnip, the larvae feeding on the foliage and roots, and various insecticides were applied in dusts to the leaves of this crop against a heavy infestation of larvae on 12th January 1957, when the temperature was 36°F. Rain occurred on 14th and 15th January, and a minimum temperature of 17°F. was recorded on 18th January. Examination of larvae collected from the soil surface showed that 15 lb. 1 per cent. parathion or 5 per cent. methoxy-DDT (methoxychlor) and 30 lb. 4 per cent. malathion per acre resulted in 62·9, 17·8 and 69·8 per

cent. mortality in ten days, respectively, as compared with 10·5 per cent. for no treatment. Examination of the soil on 4th February indicated average populations of 39·5, 53·5 and 35·8 full-fed larvae and pupae (2:1) per sample for these three treatments and 66·3 for none, and statistical analysis that parathion and methoxy-DDT gave highly significant and malathion barely significant and quite inadequate control.

In a laboratory test, acetone solutions of parathion, lindane [almost pure γ BHC], malathion and methoxy-DDT were applied topically to the dorsum of field-collected adults; the LD50's proved to be 0·3, 3·8, 8 and more than 400 μg. per weevil, respectively.

Beckham (C. M.). **Hibernation Sites of the Boll Weevil in Relation to a small, Georgia Piedmont Cotton Field.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 833–834, 1 ref. Menasha, Wis., 1958.

Surveys were carried out between 14th January and 12th February 1957 to determine the hibernation sites of the boll weevil [*Anthonomus grandis* Boh.] in and round a seven-acre cotton field in Lamar county, Georgia; considerable damage to old bolls indicated that there had been a heavy population in the field in 1956, and surface débris from adjoining woods contained 21,780 living adults per acre on 3rd December. The lowest temperature recorded was 17°F. on 18th January. Examination of all surface material over several areas of two square yards showed average populations of 7,260 and 11,374 living adults per acre at a distance of 50 ft., 2,662 and 1,694 at 150 ft. and 242 and none at 250 ft. in pine woods to the south and east, respectively, and none in dead Bermuda grass [*Cynodon dactylon*] at a distance of 50 ft. to the west. There were only 242 per acre at 50 ft. and none at 150 ft. or more in broomsedge [*Andropogon scoparius*] in a field to the north, and none in dense pine woods 825 ft. in the same direction, indicating a short flight range for weevils entering hibernation. Small numbers of living weevils (58 per acre) were found in old cotton bolls on the stalks in the field, indicating the desirability of stalk destruction.

Drooz (A. T.). **Control of *Toumeyella* Scale on Virginia Pine.**—*J. econ. Ent.* **50** (1957) no. 6 p. 835, 1 ref. Menasha, Wis., 1958.

In recent years, a species of *Toumeyella*, possibly *T. numismatica* (Pettit & McDaniel) has become numerous on Virginia pine (*Pinus virginiana*) in Maryland, Pennsylvania and West Virginia, and investigations on its control [*cf.* also *R.A.E.*, A **46** 486] were begun in May 1957 near Bedford, Pennsylvania. In the most heavily infested area, consisting of young trees, crawlers were issuing in great numbers on 14th–15th May, there was about one predacious Coccinellid larva per ten overwintering scales, much sooty mould was present and several 4-ft. pines were dead. Counts on 20th May revealed average populations of 81–137 settled crawlers per inch of twig, and an emulsion spray containing 5 per cent. malathion was applied at 6 U.S. gal. per acre in 50-ft. swathes from a speed sprayer on 21st–22nd May, when all crawlers had settled. A preliminary examination on 24th May showed heavy mortality on trees along the track of the sprayer but little kill further away. At the final observation on 1st July, there were no living scales in the treated stand, but an average of 15 living females per inch in the neighbouring unsprayed area.

In another test, treatment with 0·5 per cent. malathion in a fine emulsion spray on 21st May, using a tank-type garden sprayer, killed all settled crawlers by 24th May.

Blunck (H.). *Pieris rapae* (L.), **its Parasites and Predators in Canada and the United States.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 835–836, 1 ref. Menasha, Wis., 1958.

The author reports that a survey of the natural enemies of *Pieris rapae* (L.), made in Canada (Montreal, southern Ontario and Victoria) and California in August–November 1956, revealed no parasitism by *Apanteles rubecula* Marshall. This Braconid is a common parasite of *P. rapae* in Europe [*cf. R.A.E.*, A **41** 433], where the Pierid is less numerous than in North America. *A. glomeratus* (L.), on the other hand, was commoner than in Europe; in Germany, this species is the most numerous parasite of *P. brassicae* (L.) but seldom attacks *P. rapae*, though it parasitises the latter in the laboratory [*cf.* **41** 434]. No hyperparasitic Ichneumonids or Chalcidoids were reared from *A. glomeratus*, but dusting against *P. rapae* with DDT or other insecticides had an adverse effect on it, reducing the parasitism percentage from 20–60 where none was used to less than 6 where they had been applied a few weeks before in California. Microsporidia, which are common in *P. rapae* in Europe, were not found attacking it in California or at Victoria or Montreal, and only one of 60 larvae collected in southern Ontario was infected, probably with *Nosema polyvora*. Pupae of *P. rapae* were parasitised by *Pteromalus puparum* (L.) in Montreal and elsewhere and by Tachinids there and in California. Large numbers of larvae were destroyed before reaching the second instar in California in the autumn of 1956, probably by insect predators.

Srivastava (B. K.). **A Sugarcane Leafhopper damages Wheat in northern India.**—*J. econ. Ent.* **50** (1957) no. 6 p. 837, 2 refs. Menasha, Wis., 1958.

With the use of better varieties of sugar-cane, improved agricultural practices and increasing amounts of nitrogenous fertilisers, *Pyrilla perpusilla* (Wlk.) has increased in importance on this crop in northern India. The population becomes very high at harvest, in December–January, and the bugs then migrate to adjacent wheat fields, where the grains are in the milky stage and provide favourable food. Large numbers congregate on the ears and cause shrivelling of the grains by their feeding, which was first observed in 1951 and sometimes causes 20–100 per cent. loss of crop. When appreciable numbers occur on wheat it is essential to destroy them, and tests showed that a 5 per cent. BHC dust applied at 15 lb. per acre gave effective control.

Wolfe (H. R.). **Effect of Endrin Sprays for Mouse Control on Insects found on Orchard Cover Crops.**—*J. econ. Ent.* **50** (1957) no. 6 pp. 837–838, 3 refs. Menasha, Wis., 1958.

Endrin sprays have been tested in Washington since 1953 for the control of mice (*Microtus*) in orchards [*cf. R.A.E.*, A **46** 447], and the work included observations on their effect on insects in the lucerne cover crop. In a peach orchard in which these were abundant, applications of 1·2, 1·8 and 2·4 lb. endrin in 300 U.S. gal. emulsion spray per acre in September 1956 reduced the numbers of *Lygus* (*L. hesperus* Knight and *L. elisus* Van D.), *Euschistus conspersus* Uhl., Cicadellids (*Colladonus geminatus* (Van D.), *C. montanus* (Van D.), *Scaphytopius acutus* (Say), *Dikraneura carneola* (Stål) and *D. absenta* DeL. & Caldwell) and aphids (mainly *Macrosiphum pisum* (Harris)) from 887–957, 13–40, 89–170 and 1,430–1,812 before treatment to 0–1, 0, 0–2 and 0 per 100 sweeps of the net after 48 hours when applied over the entire area with a hand sprayer and from 560–726, 5–17,

59–85 and 996–1,067 to 2–12, 0–1, 3–16 and 302–468, respectively, when applied to the cover in the tree rows with an air-blast machine, which did not spray the area between the wheel tracks. Although endrin sprays for mouse control are applied after harvest, they should prevent large increases of some sucking insects and so result in less damage to the fruit in the following year.

Dunleavy (J. M.). **The Grasshopper as a Vector of Tobacco Ringspot Virus in Soybean.**—*Phytopathology* **47** no. 11 pp. 681–682, 8 refs. Baltimore, Md., 1957.

The tobacco ringspot virus causes a disease in soy bean in the midwestern United States and Ontario that is known as bud blight. The upper portion of the main stem, including the flower buds, is killed on young plants, and small, poorly developed pods, many of which drop, are formed on older ones. Seed transmission of the virus has been shown to occur in the greenhouse, but as the disease has not been observed in the field before the first week in July and it usually appears first at the edges of a planting, the existence of an insect vector was suspected. Grasshoppers have been reported to transmit the ringspot virus from tobacco to tobacco [*cf.* also *R.A.E.*, A **46** 18], and greenhouse tests were therefore carried out with three species of *Melanoplus* reared in cages.

In a preliminary test, *M. differentialis* (Thos.) and a mixed batch of *M. mexicanus* (Sauss.) and *M. femur-rubrum* (Deg.) were starved for four hours and then allowed to feed on infected plants for a minute and on healthy ones for five minutes. No transmission resulted, apparently because the grasshoppers fed so voraciously that the tissues were devoured as soon as they became infected. Shorter periods were tested subsequently, with examples of *M. differentialis* that had fed on infected soy bean and were allowed to feed on healthy plants for 0·5–3 minutes or to take only one bite. No transmission resulted with feeding periods greater than 0·5 minute, and 2 per cent. of the plants became infected when only one bite was taken. In subsequent tests in which only one bite was permitted on the healthy plants, *M. differentialis* and the two mixed species transmitted the virus from tobacco to 2·3 and 1·2 per cent. of soy-bean plants, respectively, and from infected soy bean to 1·2 and 0·4 per cent. The virus is evidently carried mechanically on the mouth-parts of the insects, and the relative frequency of transmission is related to their size, *M. differentialis* being almost twice as large as *M. mexicanus* or *M. femur-rubrum*.

In Iowa in 1953–56, the disease was commoner in the south, where heavy infestations of *M. differentialis* occurred, than in the centre and north, where the other species predominated. Populations sometimes reach 50,000 per acre, but the insects tend to feed on one plant, unless disturbed. After feeding, they move to other plants to rest. Bud blight is rarely reported on more than 1 per cent. of the plants in a field, and infection did not exceed 0·01 per cent. in July over four years in Iowa.

Brierley (P.) & Smith (F. F.). **Carnation Viruses in the United States.** —*Phytopathology* **47** no. 12 pp. 714–721, 7 figs., 32 refs. Baltimore, Md., 1957.

This paper comprises a review of information on the transmission and other properties of the viruses that attack carnation in the United States, based on the literature and the authors' own investigations. The common aphid on carnation there was formerly thought to be *Myzus persicae* (Sulz.),

and L. K. Jones, working with the two viruses that together cause the condition known as yellows, reported in 1945 that *M. persicae* transmitted the streak virus component, but not the mosaic one [*R.A.E.*, A **33** 174]. In 1947, the authors found that *M. persicae* transmitted the mosaic virus experimentally, but neither it nor, in later work, any other insect transmitted streak. As colonies of *M. persicae* could not be established on carnation, they considered that the carnation aphid was not typical *M. persicae* and suggested that its correct name might be *M. dianthi* (Schr.), which was originally proposed for an aphid on carnation. Hille Ris Lambers in 1956 stated that *M. dianthi* is a synonym of *M. persicae*, and from examination of aphids collected in several parts of the United States, he concluded that the common species on carnation is *M. polaris* H.R.L. Living examples of this species differ recognisably from those of *M. persicae*, but cleared specimens of the two are hard to differentiate, which accounts for their confusion by taxonomists. *M. polaris* was formerly common on greenhouse carnations in the United States, causing spotting and dwarfing of plants and blasting of flower buds, and is restricted to carnation and plants closely related to it. The injury caused somewhat resembles that due to the streak virus, and it may have been the species used by Jones, who possibly mistook the injury for symptoms of streak, but it does not transmit any carnation virus. It has become much less common in the Middle Atlantic and Midwestern States as a result of the use of phosphorus compounds against Tetranychid mites, but still occurs in areas having cooler summers, such as New England and the Pacific Northwest, where the need for mite control is less urgent.

Atkins (J. G.) & McGuire jr. (J. U.). **The Hoja Blanca Disease of Rice.** —*FAO Plant Prot. Bull.* **6** no. 11 pp. 161–166, 13 refs. Rome, 1958.

Hoja blanca, or white leaf, an insect-borne virus disease of rice having symptoms similar to those of the rice stripe disease in Japan, has aroused concern in the United States because of the heavy losses caused by it in Cuba and Venezuela. It was observed in Panama in 1952, though it was of little importance there, in Cuba in 1954 [*cf. R.A.E.*, A **45** 445], where it spread rapidly, in Venezuela in 1956 [*cf.* **46** 453], in Costa Rica and Florida in 1957 and in Colombia in January 1958. The outbreak in Florida was near Belle Glade, several hundred miles from the main rice-growing areas of the United States; the infected plants were destroyed and the areas sprayed with an insecticide.

The crop losses caused by the disease are high, commonly ranging from 40 to 75 per cent. in individual fields. Unless infected at a very early stage, the plants are not killed by the disease, however, and new tillers of a second or ratoon crop often show no symptoms. Other grasses are also susceptible to infection. The vector of stripe disease in Japan is *Delphacodes striatella* Fall. This Delphacid has not been found in rice-fields showing hoja blanca, but other Delphacids and Cicadellids occur in them. Cicadellids were reported to transmit the virus in Venezuela [*cf.* **46** 453], and *Sogata orizicola* Muir was recently found to be an important vector in Cuba. This Delphacid has been found in fields of diseased rice in Cuba, Venezuela, Colombia and Florida.

In investigations in Cuba and Venezuela in 1957, in which numerous varieties of rice were grown in areas in which natural infection was heavy on susceptible ones, all the leading varieties and all the long-grain varieties grown in the United States proved susceptible, but several minor ones were resistant. Many varieties from the Far East were also resistant. The sources of the resistance appeared to be *japonica* or short-grain types of rice.

Young (W. R.). **Experiments on the Control of Red Harvester Ant, *Pogonomyrmex barbatus barbatus*, in the Central Plateau of Mexico.**—*FAO Plant Prot. Bull.* **6** no. 11 pp. 167–173, 2 figs., 7 refs. Rome, 1958.

Pogonomyrmex barbatus barbatus (F.Sm.) is common throughout the central plateau of Mexico and constitutes a nuisance because its nests and runways render land uncultivable, it collects seeds from crop plants and from the soil at sowing time, and it is aggressive. In view of the reported effectiveness of insecticides against related ants [*cf. R.A.E.*, A **31** 503; **41** 89, etc.], experiments were carried out in the late summer and autumn of 1955 and 1956 in a small olive grove containing about 100 nests. Suspensions of wettable powders were used, and 1 litre was applied per nest, equally through all the entrances, after about 2 litres of water had been poured into each nest, both those to be treated and those serving as controls, to wet the tunnels and chambers. Counts were made of the ants leaving the nests by means of special traps, which are described; these were left over the entrances for at least three minutes on each counting date.

In 1955, five insecticides considered the most promising were used at 2·5–12·5 per cent., 65 nests were treated, and counts were made at intervals for six weeks and then after 12 and 21 months. Aldrin and chlordane gave very good results, reducing the numbers of ants leaving the nests very drastically in two days and maintaining complete or almost complete control throughout the period, with no difference between concentrations. Dieldrin also gave good immediate control, but eliminated only a few of the colonies. DDT was slow in action, but was as effective a year after treatment as aldrin or chlordane, and BHC afforded no control, appearing even to stimulate ant activity.

Chlordane, aldrin and dieldrin were tested in 1956 at 1·25 and 2·5 per cent., and counts were made for up to 37 weeks. Aldrin at either concentration gave excellent immediate results and complete control by the end of the period. Chlordane was slightly inferior, and dieldrin suppressed the ants for about six weeks but failed to give complete control in seven of the ten nests treated with it.

Kissinger (D. G.). **Description of a new *Copturus* Pest of Avocado from Mexico (Coleoptera: Curculionidae: Zygopinae).**—*Acta zool. méx.* **2** no. 3 pp. 1–8, 5 figs., 7 refs. México, D.F., 1957.

Copturus aguacatae, sp. n., is described from adults of both sexes, and *Copturomimus hustachei*, n. n., is proposed for *C. perseae* Hust. [*R.A.E.*, A **38** 313], which is preoccupied by *C.* (*Copturus*) *perseae* (Günther). These weevils all attack avocado, *Copturus aguacatae* in Mexico, *Copturomimus hustachei* in Colombia [*cf. loc. cit.*], and *C. perseae* in Costa Rica.

Sailer (R. I.). ***Solubea* Bergroth, 1891, a Synonym of *Oebalus* Stål, 1862, and a Note concerning the Distribution of *O. ornatus* (Sailer) (Hemiptera, Pentatomidae).**—*Proc. ent. Soc. Wash.* **59** no. 1 pp. 41–42. Washington, D.C., 1957.

Bergroth's proposal of *Solubea* as a new name for *Oebalus* Stål, 1862, was made on the supposition that it was preoccupied by *Oebalus* Rafinesque, 1815, but as the latter is a *nomen nudum*, the proposal was unnecessary and *Solubea* must be regarded as a synonym. A check-list of the species of *Oebalus* is given, and the distribution of *O. ornatus* (Sailer) is extended to include the Rio de Janeiro district of Brazil [*cf. R.A.E.*, A **33** 147].

Masaki (S.). **Larval sensitive Stage for the Action of external Factors controlling the Occurrence of Diapause in the Cabbage Moth Pupa,** *Barathra brassicae* **Linné.**—*J. Fac. Agric. Hokkaido Univ.* **50** pt. 3 pp. 197–210, 4 figs., 14 refs. Sapporo, 1957. **Further Experiments on the thermal Relations of the Diapause Development in the Cabbage Moth Pupa,** *Barathra brassicae* **Linné (Lepidoptera: Noctuidae).**—*T. c.* pp. 211–224, 4 figs., 5 refs.

The first of these papers contains the results of experiments carried out at Sapporo, Hokkaido, in 1952–55 to determine the period in the larval stage of *Mamestra* (*Barathra*) *brassicae* (L.) during which temperature and light influence the inception of pupal diapause. It is known that in the absence of light, exposure of larvae to temperatures of 20°C. [68°F.] or less induces diapause, and that exposure to 26°C. [78·8°F.] prevents it, in all the pupae, and that at temperatures of 20–26°C., exposure to light for 10–12 hours per day induces diapause and exposure for 16 hours prevents it.

Tests in which larvae that had hatched in the laboratory were exposed in the dark to 26°C. and single batches transferred to 19°C. [66·2°F.] at the end of each instar showed that the percentage of pupae entering diapause decreased from almost 100 when all the instars were exposed to the lower temperature to zero when the larvae were exposed only during the non-feeding period of the last (sixth) instar. A similar tendency was observed when the larvae were transferred from 19 to 26°C. after each instar, the percentage diapause increasing with the duration of exposure to the low temperature, and it is therefore concluded that, in the absence of light, the larvae are sensitive to temperature at all stages except, possibly, during their final non-feeding period. This was partly confirmed by a sudden drop from almost universal diapause, in pupae from larvae reared at 26°C. and exposed to 15°C. [59°F.] throughout the fifth instar or from the beginning of the moult at the end of it, to almost complete lack of it, when they were transferred to the low temperature on any day in the sixth instar.

The proportion of pupae entering diapause was low, with no significant difference between treatments, after exposure to artificial light for 12 hours a day during the first two, the third and fourth or the last two larval instars and for 16 hours a day in the others, and higher when the conditions were reversed, with a slight reduction, which may have been significant, when the 16-hour exposure period occurred in the last two instars. The result of subjecting the larvae to either long or short photoperiods throughout development was not affected when the treatment was reversed during the inactive periods between instars, indicating that the larvae are not particularly sensitive to light during moulting. The pupal stage lasted 13–17 days without diapause and over six months with it throughout all experiments, except for a few instances in 1954–55, when moths emerged from diapause pupae between 21–30 and 81–90 days after pupation; no explanation could be found for this anomaly, but it might represent an approach to a summer diapause such as occurs in the south of Japan [*cf. R.A.E.*, A **46** 476].

In the second paper, the effects of variations of temperature on the completion of the diapause [*cf.* **46** 363] are recorded. The pupae were collected at Sapporo in October 1955 and probably comprised diapause pupae of both generations of the year. All experiments were carried out with a low temperature of 5°C. [41°F.] and a high one of 26°C. unless otherwise stated, and the pupae were maintained at 26°C. when not being tested. In the first test, the pupae were chilled at 5°C. for periods of 5, 10, 15 or 20 days at a time or for 25 and 20 or 30 and 15 days, with intervals of ten days at 26°C. and a final five days of chilling if necessary to make

up a total of 45 days, for 15 days at a time with intervals of one or five days or for 45 days continuously. In all batches but those chilled for only 5 or 10 days at a time, in which no prompt and simultaneous resumption of development was observed, there was an apparent peak of moth emergence within 20 days after the last exposure, the duration of the pupal stage being extended in proportion to the frequency of intermittent exposure to the high temperature.

In a second test, the pupae were chilled at 5°C. for eight hours a day for 45–135 days or for 16 hours a day for 45–67 days, and comparison with pupae chilled continuously for 45 days showed that the proportion transforming to adults within six months was significantly lower after the short exposures to cold but about the same after the long ones, that the durations of the pupal stage were 127–144 and 84–92 days, respectively, as compared with 69 days, and that there was no sudden peak of moth emergence after exposure to alternating temperatures. The total duration of intermittent exposure appeared to be of little importance in this test, and it is possible either that the effect of daily exposures is not cumulative or that fluctuating temperatures have little effect in terminating diapause.

In the last test, the pupae were chilled continuously for 28, 43 or 77 days and then transferred to 15, 20, 26 or 30°C. [59, 68, 78·8 or 86°F.]. It was found that the resumption of development occurred sporadically over about 140 days when the initial chilling was insufficient, and was accelerated and concentrated over shorter periods as chilling was extended. The minimum interval before it began varied inversely with the temperature to which the pupae were transferred, but the general rate of resumption increased less rapidly than was expected as the temperature rose and was actually lower at 30 than at 26°C. after the shortest exposure to cold.

Mori (H.). **The Influence of Temperature and relative Humidity upon the Development of the Eggs of Fruit Tree Red Spider Mite** *Metatetranychus ulmi* **(Koch) (Acarina: Tetranychidae).**—*J. Fac. Agric. Hokkaido Univ.* **50** pt. 3 pp. 363–370, 3 graphs, 8 refs. Sapporo, 1957.

An account is given of experiments in which adults of *Panonychus* (*Metatetranychus*) *ulmi* (Koch), which causes serious damage to fruit trees in northern Japan, were collected on apple in Hokkaido in June 1956 and eggs laid by them in the laboratory not more than 12 hours previously were transferred to relative humidities of 17, 28–33, 49–57, 72–77, 90–94 and 100 per cent. and temperatures of 15, 20, 23, 25, 27, 30 and 35°C. [59, 68, 73·4, 77, 80·6, 86 and 95°F.] and examined daily. None hatched at the highest temperature or lowest humidity or at 15 or 30°C. and 28–33 per cent. humidity, and 90 per cent. or more hatch was obtained only at temperatures of 15–30°C. and humidities of 72–77 or 90–94 per cent. and at temperatures of 15–23°C. and 100 per cent. humidity. Embryonic development was completed over a wider range, including 20 and 23°C. at 17 per cent. humidity and 15 and 30°C. at 28–33 per cent., and reached 87–100 per cent. at temperatures of 15–30°C. and humidities of 49–57 per cent. or more, indicating that the embryos are more resistant to temperature and humidity during development than at hatching.

The average duration of the egg stage tended to be shorter at 90–94 and 72–77 per cent. than at any other relative humidity and at 27°C. than at any other temperature, varying from 4·95 days at 27°C. and 92 per cent. to 15·42 days at 15°C. and 57 per cent. relative humidity. Temperature appeared to have more effect than humidity.

Way (M. J.) & Needham (P. H.). **Control of some Bean and Potato Pests using a Systemic Insecticide applied to the Soil and Seed.**—*Plant Path.* **6** no. 3 pp. 96–103, 3 graphs, 9 refs. London, 1957.

The value of demeton (diethyl 2-(ethylthio)ethyl phosphorothioate) applied at sowing or planting time in controlling pests of beans and potatoes [*cf. R.A.E.*, A **44** 147] was investigated in experimental plots in southern England. A purified preparation was used in most of the experiments, either diluted in activated charcoal to 30 per cent. as a dust or to 45 per cent. as a seed dressing, or, mixed with an equal volume of emulsifier, as a water emulsion. A 50 per cent. ready-mixed activated-charcoal dust was also used.

In experiments with spring-sown tick beans [*Vicia faba*], germination was not prevented by application of as much of the seed dressing as would adhere (0·026 g. demeton per seed) or by soil treatment at 2·5 g. 30 per cent. dust per ft. of row, but soaking the seeds for four hours at 20°C. [68°F.] in emulsions containing 0·5–4 per cent. w/v demeton reduced it from 100 to 93–74 per cent. In a field test, neither the seed dressing (0·012 g. demeton per seed) nor the soil treatment (0·18 g. demeton per seed) affected germination, but soaking the seeds in a 2 per cent. emulsion for four hours, which provided an estimated dosage of 0·0031 g. demeton per seed, reduced it from 93–94 to 66–80 per cent. In some cases, the first leaves of plants from dressed seeds or seeds sown in treated soil showed slight scorching, and the primary roots were sometimes destroyed, so that growth was checked until adventitious roots had formed. In tests at two places with beans sown on 10th March, the dressing and soil treatment (0·012 and 0·18 g. demeton per seed, respectively) gave good protection from infestation by *Sitona lineatus* (L.), assessed as the average number of feeding notches per plant, for 73 days; on plants grown from soaked seeds that each received a dosage of 0·003 g. demeton, attack was reduced 55 days after sowing but was little lower than on untreated plants after 73 days. The toxicity of leaves from plants grown from dressed seed was confirmed in the laboratory. The value of the seed and soil treatments and of an emulsion spray containing 0·025 per cent. demeton applied to the foliage at about 80 gals. per acre on 18th June in controlling primary migrants of *Aphis fabae* Scop., the progeny of which are largely responsible for the damage caused by this aphid to beans, was also investigated. The spray (0·001 g. demeton per plant) and soil treatment gave 94–99 per cent. control, but the others were relatively ineffective, though all except the seed-soaking treatment at one place caused a significant reduction in infestation. Soil type is not considered to exert an important effect on the protection afforded. Confirmation of the persistence of the different formulations in the bean plants was obtained by confining young adults of *Megoura viciae* Buckt. on the shoots at intervals from 62 to 138 days after sowing and counting the living aphids a week later; the soil treatment (0·19 g. demeton per plant) killed all the aphids 62 days after sowing and remained effective for over 120 days, whereas the effects of the seed dressings (0·014 and 0·006 g. demeton per seed) and the seed-soaking treatment (0·0037 g. demeton) were almost all lost after 80 days.

In work with *Myzus persicae* (Sulz.) on potato, the 50 per cent. dust was scattered in the planting holes at 0·125, 0·25, 0·5 and 1 g. demeton per tuber on 12th May, and young adults were confined on the stems at intervals from about 40 to 112 days after planting. Counts of the numbers still living after a week showed that all the dosages were effective for about 40 days, but only the highest two gave good protection after 112 days. Soil collected round some of the parent tubers on 10th September was placed in

culture solutions containing young bean plants, on each of which 20 adults of *Megoura viciae* were confined. All the aphids died within a week, whereas there was a considerable increase when untreated soil was used. The loss of protection observed in the field after a few weeks was probably due to the spread of the roots beyond the region in which the insecticide was concentrated. The ability of large populations of *Myzus persicae* to develop on shoots produced by daughter tubers from the experimental plots taken from store on 22nd December was greatly reduced in those from plants that had received demeton at the two highest concentrations. In the course of the field experiment, the demeton treatments were observed to be effective against the Mirid, *Calocoris norvegicus* (Gmel.), of which the highest dosage gave complete control, but not against larvae of *Agrotis* spp. in the soil.

It is concluded that although seed dressings containing small amounts of systemic insecticides such as demeton can control early attack by *S. lineatus* on beans and *M. persicae* on potatoes and might protect late-sown beans from *A. fabae*, both they and soil applications are probably of limited value in providing long-lasting effects in the stems and leaves, for which the dosages required may be uneconomic and hazardous. An advantage of seed dressings or soil treatment over the seed-soaking method is that absorption may occur over a longer period and so confer longer protection. The use of demeton for these purposes is limited by its cost and toxicity to mammals.

HEATHCOTE (G. D.). **The optimum Size of sticky Aphid Traps.**—*Plant Path.* **6** no. 3 pp. 104–107, 9 refs. London, 1957.

In work at Rothamsted on the numbers of aphids caught on cylindrical adhesive traps of different sizes, conflicting results were obtained when upright yellow traps 30 cm. long and 12·5, 6·2 or 3·1 cm. in diameter were exposed over bare ground in August–October 1952 and black, but otherwise similar, traps were exposed in June–August 1954. When two black and two yellow traps of each size were exposed simultaneously between 13th June and 29th August 1956, the total numbers of aphids caught were 3,591 for the black and 3,528 for the yellow ones [*cf. R.A.E.*, A **37** 365]. The aphids were removed at least twice a week, and the mean catch per trapping period was significantly greater on traps of large than of medium diameter and of medium than of small diameter and on yellow than on black traps of equal diameters. More aphids were caught on wide black traps than on narrow yellow ones and more per unit area on narrow traps than on wide ones; doubling the surface area of the trap did not double the catch. At wind speeds of 1½ miles per hour and over, aphids cannot direct their flight but are blown like inanimate particles. Since P. H. Gregory found that the number of *Lycopodium* spores deposited on adhesive cylinders in a wind tunnel increased with increase in wind speed and decrease in cylinder diameter, more aphids would be expected on narrow cylindrical traps than on wide ones in windy weather, and this was the case in 1952. Wide traps were the more effective throughout the flight period in the other two years.

The relative effectiveness of horizontal traps of different sizes was investigated in 1954 by means of slightly convex surfaces, painted black except for a central yellow area 15, 30 or 60 cm. square and covered with plastic sheets coated with adhesive. They were exposed over bare ground between 15th June and 28th August, and the total numbers of aphids caught were 229, 664 and 2,002, respectively, of which *Aphis fabae* Scop., the only one of economic importance, comprised 31, 119 and 278. The medium-sized trap caught most and the smallest one the fewest aphids per unit area.

Alate aphids are important vectors of virus diseases, even if not numerous, and large adhesive traps are therefore more effective against them than small ones which trap fewer. In the field, adhesive traps more than 50 cm. square are difficult to handle, especially in high winds, and under some conditions water traps are more satisfactory for detecting small numbers of aphids [*cf.* **45** 388].

Light (W. I. St. G.) & Moreton (B. D.). **The Control of Cabbage Root Fly in Seedbeds.**—*Plant Path.* **6** no. 3 p. 109. London, 1957.

In a test in Kent in 1956 on the protection of cauliflower seedlings from attack by the cabbage root fly [*Hylemyia brassicae* (Bch.)], dusts of aldrin and dieldrin were broadcast over the seed-beds and incorporated into the soil to a depth of 2–3 in. immediately before sowing and these dusts and one of 50 per cent. Dipterex [dimethyl 2,2,2-trichloro-1-hydroxyethyl-phosphonate] were applied in the drills at sowing time. Seeds were sown on 11th May and damage was assessed when the young plants were lifted on 11th July. There were significantly more undamaged plants in the plots treated with aldrin broadcast at 2·8 and 5·6 lb. per acre or applied to the drills as a 1·25 per cent. dust at 0·5 or 1 oz. toxicant per 10 yd. of row and in those treated with dieldrin broadcast at 2·8 lb. per acre than in the untreated controls; aldrin appeared to be more effective than dieldrin, though the differences between them were not significant. Dieldrin applied to the drills at 0·4 and 0·8 oz. per 10 yd. of row did not give significant protection, and more plants were damaged in the plots treated with Dipterex than in the controls.

Slope (D. B.). *Opomyza florum* **on early-sown Winter Wheat.**—*Plant Path.* **6** no. 3 p. 110. London, 1957.

In 1956 and 1957, winter wheat sown in September, October, November and December at Rothamsted was attacked by *Opomyza florum* (F.) [*cf. R.A.E.*, A **22** 1], the larvae of which feed in the central tissues of the tillers and eventually kill them. The percentages of plants and (in brackets) shoots infested were 27·6 (8), 3·9 (1·2), 0 (0) and 0·2 (0·1), respectively, on 1st May 1956 and 82·8 (36·4), 31·5 (8·6), 7 (1·9) and 4·7 (1·6) on 2nd April 1957. Heavy infestations in September- and October-sown wheat may not seriously reduce yields, however, since the plants are well developed when the eggs hatch in spring and only late side tillers are usually affected. In 1956, the yield from September-sown wheat was almost one ton per acre greater than that from wheat sown in December, and though yields for 1957 were not available at the time of writing, the stand of September-sown wheat on 2nd April was probably sufficient to provide a good crop. Infestation by the Geomyzid was not much affected by sowing rates.

Vernon (J. D. R.). **An Eriophyid Mite causing Damage to Chrysanthemums.**—*Plant Path.* **6** no. 3 p. 111. London, 1957.

An Eriophyid identified as *Epitrimerus alinae* Liro severely damaged chrysanthemums under glass in Cheshire in the autumns of 1954 and 1955, and was also found on chrysanthemums in nurseries in Staffordshire and Shropshire in 1954. Similar damage was reported, apparently for the first time in Britain, on chrysanthemums in Scotland in 1949, though Eriophyids were earlier recorded damaging chrysanthemums in Middlesex and have

recently been reported infesting or damaging them in the West Midlands and in Yorkshire. In Cheshire in 1954, *E. alinae* was abundant among the hairs on the stems, most of the mites occurring 3–6 in. below the flowers. Their feeding caused russetting of the stems and, where the bases of the petioles were affected, drooping of the leaves and, in some varieties, premature leaf-fall; where russetting was severe, the mites migrated into the sepals and flowers. Smaller numbers occurred on the upper surfaces of the leaves. Damage was less severe in 1955, but infestation is believed to have affected the quality of the flowers of one white variety. A spray of chlorobenzilate [ethyl 4,4′-dichlorobenzilate] was of little value against the mites in 1954, possibly owing to the use of an ineffective wetting agent, and sulphur applied as a fungicide did not prevent populations from increasing, but a spray of 12 oz. Metasystox [dimethyl 2-(ethylthio)ethyl phosphorothioate (methyl-demeton)] per 100 gal. gave complete mortality in five days.

Blankwaardt (H. F. H.). **De kleine bonte essenbastkever in het Amsterdamse Bos** (*Hylesinus fraxini*). [The Ash Bark-beetle, *H. fraxini*, in the Amsterdam Wood.]—*Ned. Boschb. Tijdschr.* **28** no. 6 pp. 141–150, 3 figs., 1 map, 6 refs. Wageningen, 1956; also as *Meded. Inst. toegep. biol. Onderz. Nat.* no. 24. Arnhem, 1956. (With a Summary in English.)

Ash trees in the woods near Amsterdam are infested by *Hylesinus fraxini* (Panz.), and the bionomics of this bark-beetle were investigated in 1953–55 as it was suspected of facilitating bacterial infection of the trees. In general, it has only one generation a year, and the adults overwinter in the bark of healthy trees, which they leave in spring, flying to newly dead wood. Maternal galleries are formed in this, and the progeny reach maturity in summer, leave the trees in which they have developed and overwinter. The observations in the three years showed that maternal galleries were formed mostly between late May and mid-June, egg-laying reached its peak between the end of May and July, larvae were commonest at the end of June or in July and pupae between the end of July and the end of August, and the adults emerged mostly in September. Larvae of a second generation were observed in 1953, after regeneration feeding by a few beetles at the end of June, but no adults were produced. Winter precipitation is important for the availability of suitable breeding material, since it maintains dead wood in a moist condition. Clearance of dead wood afforded good control in old stands, where the beetle population was high, but was less effective in younger ones, where it was much lower. It appeared unlikely that the Scolytid was concerned in the dissemination of the bacteria.

Hein (G.). **De plaag van de rode dennenbladwesp** (*Diprion sertifer* **Geoffr.**) **in Nederland in de jaren 1949–1954 en een onderzoek naar in de voedselplant liggende, de ei-afzetting remmende factoren.** [The Outbreak of *Neodiprion sertifer* in Holland in the Years 1949–54 and an Investigation of Food-plant Factors restricting Oviposition.]—*Ned. Boschb. Tijdschr.* **28** nos. 11–12 pp. 257–265, 285–297, 5 figs., 4 graphs, 50 refs. Wageningen, 1956; also as *Meded. Inst. toegep. biol. Onderz. Nat.* no. 26. Arnhem, 1956. (With a Summary in English.)

An outbreak of *Neodiprion* (*Diprion*) *sertifer* (Geoffr.) on pine began in Holland in 1949, and observations on the bionomics of the sawfly made in the course of it are recorded. It was terminated by 1954, very largely as a

result of infection of the larvae by a bacterial disease, which was present already in 1949 and caused very high mortality of the larvae in succeeding years. No parasites of the eggs were observed, but *Exenterus amictorius* (Panz.) (*marginatorius* (F.)) and *Aptesis* (*Microcryptus*) *basizona* (Grav.) parasitised the cocoon stages to a varying and often high degree. Since oviposition in one area in 1949 appeared to be much less than would have been expected from the cocoon population giving rise to adults in that year, a special investigation was made of the effect of the condition of the tree on oviposition. It was found that eggs were not laid in very narrow or very broad needles, and that the number laid per shoot was related to the water content of the latter, reaching a maximum at a water content of 63–64 per cent. and then declining rapidly. The implications of these observations in the sudden termination of outbreaks is discussed.

Völk (J.) & Krczal (H.). **Übertragungsversuche mit** *Piesma quadratum* **Fieb., dem Vektor der Kräuselkrankheit der Zucker- und Futterrübe.** [Transmission Tests with *P. quadratum*, the Vector of the Crinkle Disease of Sugar- and Fodder-beet.]—*NachrBl. dtsch. PflSchDienst.* **9** no. 2 pp. 17–22, 2 figs., 21 refs. Stuttgart, 1957.

Adults of *Piesma quadratum* (Fieb.) are the only known transmitters of the virus causing leaf-crinkle disease of beet [*cf. R.A.E.*, A **31** 374], which has recently spread to parts of northern Germany [*cf.* **46** 67], one short period of feeding on an infected plant rendering them permanently infective [*cf.* **27** 688]. For the transmission tests described, adults of *P. quadratum* were collected near Brunswick, mostly from a field of beet showing all symptoms of the disease, including those of the severest form [*cf.* **17** 582], and allowed to oviposit on filter papers, which were then placed on healthy beet. As the virus is not passed through the egg, uninfected individuals were thus obtained. Infected plants from the same field served as the source of the virus.

In the first test, uninfected nymphs were left on an infected plant for 48 hours, and the resulting adults, which emerged 14–24 days later, were transferred singly to successive healthy beet seedlings every 24 hours until they died, after about a month. They transmitted the virus to 15·4 per cent. of the seedlings when they were placed on the cotyledons and to 15·2 per cent. when they were placed on the first true leaves. Transmission was effected by six out of ten adults within the first five days and by the rest within ten days. The longest interval between two successive infections was 16 days. The infected nymphs did not transmit the disease to the beet plants on which they were reared. In the second test, young uninfected adults were fed on infected beet for 48 hours and then transferred to successive healthy seedlings as before. They transmitted the virus to 32·5 and 23 per cent. of the latter when they were placed on the cotyledons and the true leaves, respectively, and transmission was effected by all of them within the first five days. The intervals between transmissions lasted for up to six days on cotyledons and 13 on true leaves. When infected overwintered adults were used, they transmitted the disease to 53·3 per cent. of the plants, and the intervals between successive transmissions were generally shorter than for the young adults. In a discussion of these results, it is suggested that the absence of infectivity in the nymphs and its increase with age in the adults may result from retention of the virus in the gut of the former, in which it may actually decrease in quantity, and its passage into the haemolymph, and hence into the salivary glands only after adult emergence, transmission then occurring as often as the rate of multiplication of the virus permits. This would account for the high infectivity of the overwintered

adults, which feed at a time when the plants are still small and have little resistance to the disease.

In other tests, young infected adults did not cause the appearance of symptoms on various wild chenopodiaceous plants [*cf.* **24** 133] on which they fed, and attempted back-transmission from these to beet also failed.

Heinze (K.). **Weitere Versuche zur Übertragung von phytopathogenen Viren mit Blattläusen.** [Further Tests on the Transmission of phytopathogenic Viruses with Aphids.]—*NachrBl. dtsch. PflSchDienst.* **9** no. 2 pp. 22–25, 2 figs., 10 refs. Stuttgart, 1957.

Since aphids flying in search of suitable food-plants may spread infection with non-persistent viruses even among plants on which they do not breed, experiments were carried out in Germany in 1952–55 in which some 70 species of aphids were tested for their ability to transmit viruses of wild or cultivated plants to plants of the same or other species. Transmission of one or more viruses was effected by about half of them, and the results obtained with these are shown in a table and discussed. *Myzus* (*Myzodes*) *persicae* (Sulz.) was found to transmit six viruses, and *Rhopalosiphoninus latysiphon* (Davidson) occasionally transmitted potato leaf-roll from infected to healthy potato.

Hopkins (J. C. F.). **Tobacco Diseases: with special Reference to Africa.**—10 × 6¼ ins., xvi + 178 pp., col. frontis., 56 pls. (4 col.), 6 figs., 5 pp. refs. Kew, Commonw. mycol. Inst., 1956. Price £1 15*s*.

This review of information on the diseases of tobacco in Africa includes a section (pp. 119–136) on the virus diseases that affect the crop. Three of these are insect-borne, namely, leaf-curl [*cf. R.A.E.*, A **23** 692], which is transmitted by *Bemisia* [*tabaci* (Gennadius) (*cf.* **46** 136)], rosette, caused by a combination of the mottle and the vein-distorting viruses, which are transmitted together, but not separately, by *Myzus persicae* (Sulz.) [*cf.* **36** 422], and kromnek, which is caused by the tomato spotted wilt virus and transmitted by thrips, the commonest vectors in South Africa being *Frankliniella schultzei* (Tryb.) and *Thrips tabaci* Lind. [*cf.* **36** 45]. The information given on these diseases relates to their distribution in Africa, the symptoms caused, conditions favouring infection and methods of control, largely by measures directed against the insect vectors.

Papers noticed by Title only.

Bärner (J.). **Bibliographie der Pflanzenschutzliteratur. Bibliography of Plant Protection . . . 1948–49.**—xli + 689 pp. Berlin, P. Parey, 1958. Price *DM.* 65. [*Cf. R.A.E.*, A **45** 372, etc.]

Wittmer (W.). **Insects of Micronesia. Vol. 16 no. 2. Coleoptera: Lampyridae, Cantharidae, Malachiidae, Prionoceridae.**—pp. [5 +] 67–74, 3 figs., 1 map. Ford jr. (E. J.). **Coleoptera: Anobiidae.**—pp. 75–83, 2 figs. Chûjô (M.). **Coleoptera: Bostrychidae.**—pp. 85–104, 3 figs. Strohecker (H. F.). **Coleoptera: Endomychidae.**—pp. 105–108, 2 figs. Honolulu, Bishop Mus., 1958. [*Cf. R.A.E.*, A **43** 345; **46** 404.]

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